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FACTORY

[ANAGEMENT AND MAINTENANCE

McGRAW-HILL PUBLICATION

JANUARY 1943

McNUTT: Manpower Outlook — *page 74*

BYERS WROUGHT IRON

★

Reducing Maintenance isn't one job—

IT'S 2

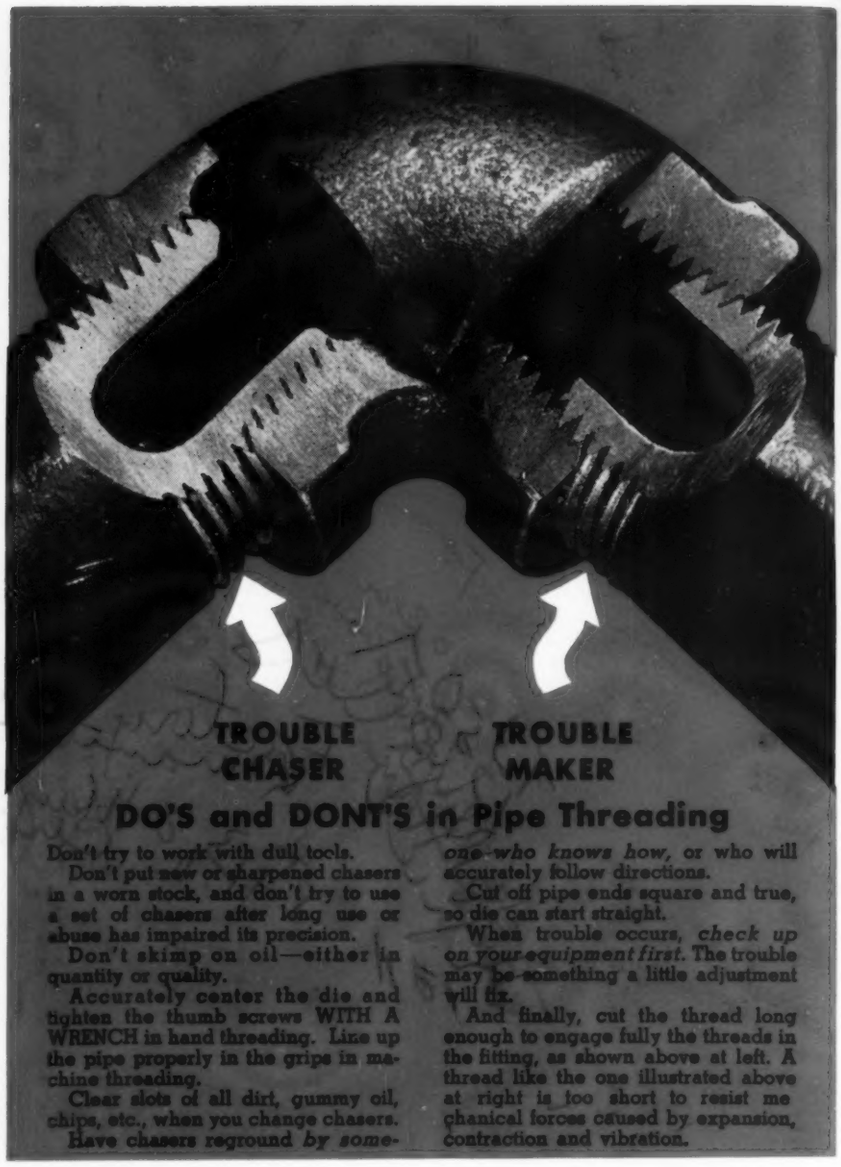
★Proper Material Selection

★Proper Installation Methods

Maintenance of piping systems is one of the primary responsibilities of most plant engineers. The job is complicated today by three-shift operations, lack of "stand-by" equipment, and material shortages.

In eliminating premature failures, there is no substitute for picking the right material for the job . . . but improper installation practice can offset all the good accomplished by proper selection.

Pipe has been one of the main Byers products for over 75 years. During this time the company has, through individual contacts with plant engineers, learned a considerable amount about piping problems. Much of this information has been transferred to paper in the form of technical bulletins and "ready-reference" charts (listed below) and confidential studies and reports carried by Byers technical service representatives.


TROUBLE CHASER
TROUBLE MAKER
DO'S and DONT'S in Pipe Threading
Don't try to work with dull tools.
Don't put new or sharpened chasers in a worn stock, and don't try to use a set of chasers after long use or abuse has impaired its precision.
Don't skimp on oil—either in quantity or quality.
Accurately center the die and tighten the thumb screws WITH A WRENCH in hand threading. Line up the pipe properly in the grips in machine threading.
Clear slots of all dirt, gummy oil, chips, etc., when you change chasers.
Have chasers reground by someone who knows how, or who will accurately follow directions.
Cut off pipe ends square and true, so die can start straight.
When trouble occurs, check up on your equipment first. The trouble may be something a little adjustment will fix.
And finally, cut the thread long enough to engage fully the threads in the fitting, as shown above at left. A thread like the one illustrated above at right is too short to resist mechanical forces caused by expansion, contraction and vibration.

Current conditions make this information of even greater value than normally. Please feel free to ask for any of the publications, to supplement your file of engineering data, to pass on to subordinates who are now handling new and more responsible jobs, or to use in the training of new employees.

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FACTORY
MANAGEMENT AND MAINTENANCE
JANUARY 1943

McNUTT: Manpower Outlook — page 74

On the cover, 7-man inflatable attack boats in the round-the-clock production at a New England plant of the United States Rubber Company. Modern ventilation equipment changes the air ten times an hour, thus preventing pockets of solvent fumes from gathering and thereby safeguarding workers' health. Fluorescent lighting provides from 35 to 40 foot-candles in manufacturing areas.

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FACTORY

MANAGEMENT AND MAINTENANCE

JANUARY · 1943

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Power—Giant Arm of Production

Ninety Per Cent of American Industry Is Electrified

ELECTRICITY is the mainspring that turns the wheels of our factories, mills and mines. It is the tireless arm that grinds our grain, weaves our cloth, pumps our water, builds our planes, our guns, our ships, our cars, our trucks and tanks . . .

The mighty Pharaohs had less energy at their disposal in building their pyramids than is generated today by one single power plant. The combined capacity of America's central power systems is without parallel in the history of the world . . . 46 million kilowatts, i.e., 65 million horsepower in steam turbines, hydro turbines and other prime movers. That is more power, day in and day out, than 650 million slaves could produce—for a limited time—minutes in fact.

The capacity of this vast fountain of energy is beyond the grasp of the average man who flips a switch and sets in motion machines that perform the labor of a thousand man-hours in a matter of minutes. Perhaps only the old time farmer, whose traditional source of power is a team of tired horses and a pair of calloused hands, knows how to appreciate this commodity that is so vital an ingredient of everything we consume and use.

Yes, we take electricity for granted. We expect it to appear in unlimited quantities, like water and air, as we need it. Almost as essential as these two elements in times of peace, it becomes a matter of life and death in times of war. Industry would collapse without it and the nation would quickly perish.

With the catastrophe of Pearl Harbor a little over a year ago, came the realization that we had to out-produce our enemies. To out-produce our enemies, who had a seven year head start, meant to turn more wheels than they were turning and to turn them faster than they were turning them.

New plants sprung up overnight. Production increased beyond our wildest dreams. Aircraft and shipbuilding surpassed the most daring forecasts. The machine tool industry's output grew to a volume that bordered on the miraculous. Guns, shells, uniforms, shoes, tanks and a thousand other items were being made in hitherto undreamed of quantities. All of them have one common essential ingredient – power. Industry demanded power – more and more power!

It is no small tribute to the power industry that, while other raw materials developed shortages necessitating strict priorities control, electricity remains unrationed – no priorities, no curtailments, no rate increase. Current industrial consumption is running 16 per cent over 1941 and 50 per cent over 1940. Not spectacular perhaps but when we consider that the nation's 26 million domestic consumers utilize only about 14 per cent of the energy output, we begin to get some idea of industry's power consumption.

Our power companies might have been stunned by the prospect of mounting demands for kilowatts. Instead they set about developing and coordinating a multiplicity of relatively small and seemingly unrelated factors. Individually or even collectively, these have not been of a spectacular nature. Certainly they have not inspired the award of the Army-Navy E although they are an essential ingredient in every Army-Navy E that has been awarded to American industry.

The contribution of the power industry to the winning of the war is not likely to flame forth in newspaper headlines. It takes the more prosaic turn of portraying an industry that is doing wonders quietly, unobtrusively.

At the close of the last war the power at the disposal of the American industrial worker averaged 3⅓ horsepower. At the beginning of this war, twenty years later,

This is the seventh of a series of editorials appearing monthly in all McGraw-Hill publications, reaching more than one and one-half million readers, and in daily newspapers in New York, Chicago and Washington, D. C. They are dedicated to the purpose of telling the part that each industry is playing in the war effort and of informing the public on the magnificent war-production accomplishments of America's industries.

it had increased to 6½ horsepower. What other nation can even approach that figure? This large provision of power is the achievement of the electric utility industry. For years it had built and applied its equipment to the highest standards of performance and operated its systems to equally high standards of service and dependability. Always recognizing that "public service is a public trust" it had maintained wide margins of security in performance. Today these margins are the source of the power industry's ability to rise to the emergency.

In short, the electric utilities were prepared!

Power men are accustomed to looking ahead, to prepare for growing loads and allow for unforeseen contingencies, for electricity cannot be stored. It is "ordered" by touching a switch. It is delivered and consumed at the same moment.

Months before the actual outbreak of hostilities foresighted power men set to work computing how much life of equipment could be risked in the process of crowding it toward greater output. Generators, boilers, turbines, cables, transformers and even conductors underwent close scrutiny in an effort to increase the load – *safely*. They figured, they experimented, they tried untried measures.

Insulation, for example, is the crux – the least known component of electrical apparatus. When it lets go the service suffers. It is not easy to know how near any bit of crucial insulation is to letting go. It takes courage to work it to a point just short of failure . . . but that is exactly what is being done today.

Technological forcing of equipment, however, is not all of the story. Obsolescent equipment has been rehabilitated; salvage has been intensified; critical metals have been replaced by non-critical materials; water sprays, air-blowers and other cooling methods have been installed to keep over-loaded apparatus from over-heating. Nothing has been overlooked. Ingenuity has contrived the well nigh impossible.

Hand in hand with these measures of expediency have gone measures of intensification. Hydrogen pressure for cooling generators has been stepped up from ounces to pounds taking more heat away from the machines and enabling them to carry greater loads. Capacitors – little more than aluminum foil interleaved with thin paper – have been applied by the carload relieving the systems of that mysterious reactive current which is associated with that equally mysterious power factor. They have performed wonders in avoiding the need for additional generating and transforming equipment. The use of portable sub-stations has averted the otherwise necessary reserve capacity in fixed installations at many points.

When coal was placed on the urgent list last spring the electric utilities outstripped all other industries in providing storage for the winter. Stocks on hand the first of October were sufficient for 105 days, or more than twice what would be considered adequate in times of peace.

When staff losses to the armed forces became serious power companies contrived measures that enable them to get along without aggravating the national manpower situation by hiring others to replace them. Today meters are being read every two or three months instead of monthly; women are being trained to do drafting, keep the logs in power plants and sub-stations and to test meters in shops and laboratories.

On the summit of "Grandpa's Knob", a mountain overlooking Rutland, Vermont, stands a giant windmill that would have been the delight of Don Quixote. Towering 200 feet above the tree tops its mighty 175 foot propeller turns with the wind and drives a 1,000 kilowatt generator which feeds its output into the Central Vermont Public Service Corporation's power system. The most ambitious wind-turbine generator in the world, and a daring experiment of forward-looking men.

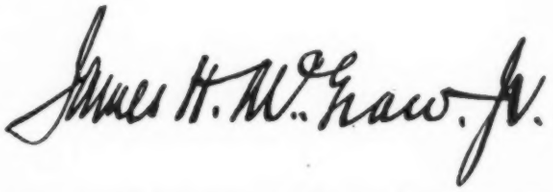
Today everything electrical is being tried; is being worked harder than it has ever been worked before.

Great credit is due the men behind the electric power industry. These men have recognized the responsibility of their jobs – it is a part of their very being. Theirs is the kind of service that *must* be maintained. No soldier is truer to his trust than is the employee of this great industry.

The service must go on! No matter what happens – acts of God or deeds of men – the service must go on! Labor disturbances may disrupt other industries but there have been no shutdowns due to labor trouble in electric power plants since Pearl Harbor.

And this winter when blizzards pile up drifts and sleet makes pavements slippery there may be absenteeism from other plants but the utility employees will be on the job ready to climb the ice-covered poles and repair the ice-laden lines whenever the call comes.

In this war the least costly yet the most precious element of production – electricity – will be ever ready to "man" the machines that will produce the weapons that will give victory to the forces of freedom.



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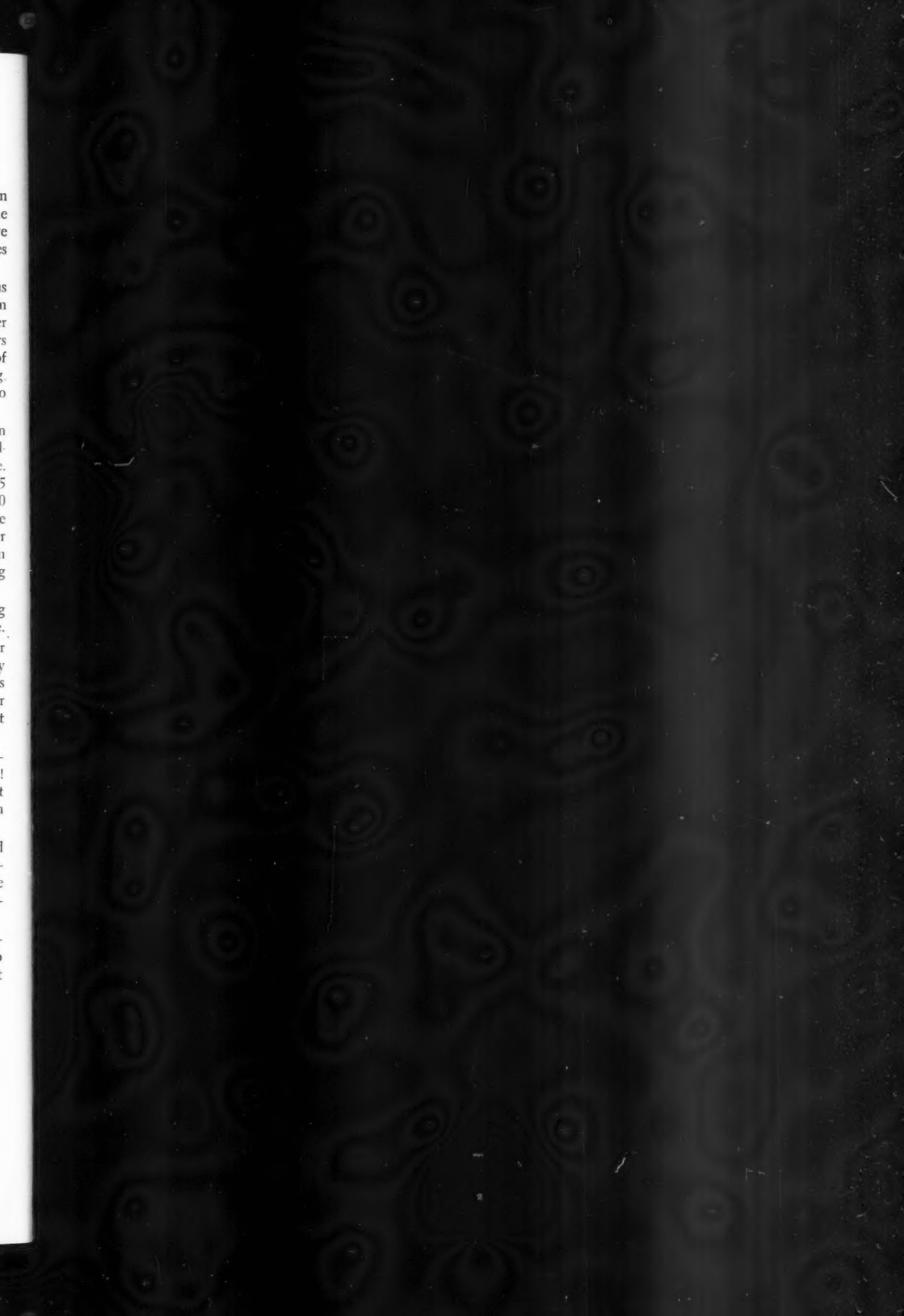


FACTORY
MANAGEMENT AND MAINTENANCE

L · C · MORROW · EDITOR

Scrap It!—Top Man's Say-So

The steel industry does not feel certain that it will get all the scrap it needs in 1943. Nor does the government. Both are appealing to industrial plants to see that there is no shortage. Certainly something has to be done to see that the scrap becomes available, because, if it does not, the production of many of the most important implements of war will bog down. And if that happens, there will be an end to the present gratifying progress on the several fronts on which our armed forces are engaged. Carried far enough, our lessened production, caused by lack of scrap, could result in such complete reversal that the Axis would again have the upper hand.

It is a good rule of thumb that steel consists of 50 percent scrap. On a 90-million-ton basis for 1943, that means 45 million tons of scrap have to come from somewhere. The willing householder cannot do it alone—and his kind of scrap is none too good anyway. Agricultural scrap is some better, and short-handed farmers will find a way to pull it together.

However, the bulk of the 1943 scrap has got to come from industry. Chips will provide a share, of course—they must be disposed of. But they will not nearly reach the goal. And they are available in appreciable quantities only in the metal-working plants. Recirculating scrap will furnish a total of around 27 million tons. There remains to be secured from purchased scrap more than 14 million tons.

Actually, 1943 scrap must come from all kinds of manufacturing plants. Much of it must be what the salvage people in Washington call "dormant" scrap. They mean "obsolete machinery, tools, equipment, dies, jigs, fixtures, etc., which are incapable of current or immediate future use in the war production effort because they are broken, worn out, irreparable, dismantled, or in need of unavailable parts necessary to practical re-employment."

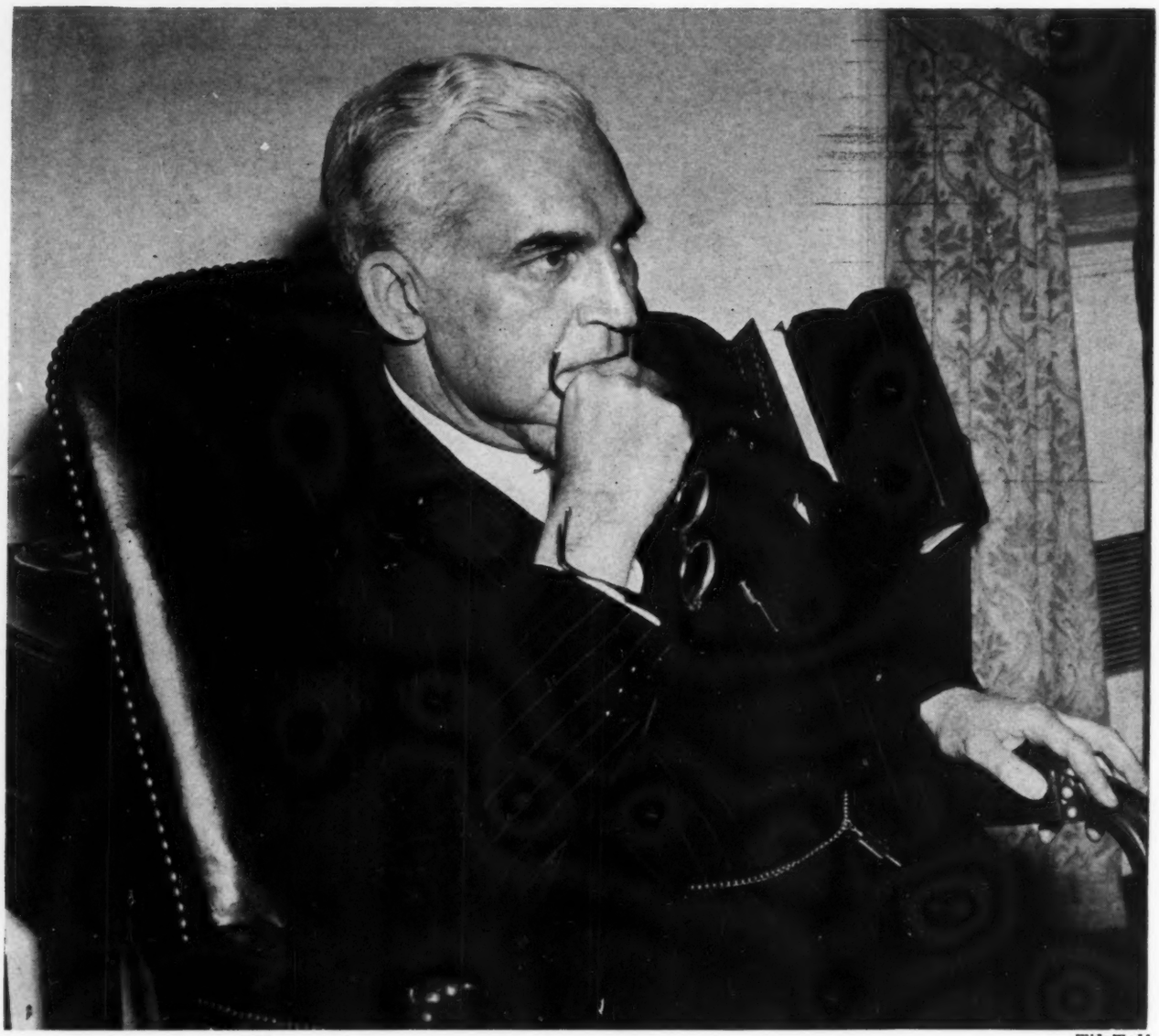
The WPB Salvage Committee proposes that this rule be followed: "If it hasn't been used for three months, and if someone can't prove that it's going to be used in the next three—sell it—or scrap it!"

There is only one way to get at dormant scrap. Someone who knows the equipment and has the requisite authority must go through the plant and condemn whatever can be spared. No subordinate is going to take the risks involved. He would be certain to feel that he was scrapping his job along with the equipment. He would be morally certain that his judgment would be questioned at later dates by superior executives.

It is highly important that in each industrial plant a 1943 dormant-scrap program be started and kept up; and that the job be done by a top executive.

L C Morrow

MANPOWER



Wide World

WHAT are some of the most significant recent developments in the manpower field? That is one of two questions which FACTORY has asked me to answer in this brief statement to plant operating men in the manufacturing industries.

From industrial management's point of view, these factors, I believe, stand forth prominently in the immediate foreground of the manpower picture: (1) The order virtually stopping voluntary enlistments, and (2) the ready acceptance which is being given throughout industry to the Manning Table Plan.

The cessation of enlistments should make a tremendously favorable change in today's troublesome turn-over situation. Labor turn-over has many causes, of course—not the least of which is pirating. But, in plant after plant, voluntary enlistments have made heavy, irregular, and often disruptive inroads on personnel, frequently exceeding Selective Service withdrawals.

We of the Manpower Commission saw the need for stopping enlistments, and I am gratified beyond measure that the change has come. Employers will be equally gratified when the effect of the order becomes evident. They will find, I am sure, that the rate at which they lose men to the armed services will become much more stable and predictable, while the restless tendencies of military-age workers will naturally be stilled.

As for the Manning Table Plan, there is nothing surprising in the fact that its eventual complete acceptance

R OUTLOOK

By PAUL V. McNUTT
Chairman, War Manpower Commission

A message to management which underscores (1) importance of preparing manning tables, (2) impact of Selective Service withdrawals and resulting need for training and upgrading, (3) value of local manpower programs, and (4) urgency of combating the increasing evil of voluntary absenteeism in war plants.

already seems assured. Participation in the plan is so obviously to management's as well as the nation's advantage that it could not be otherwise. For the present, replacement schedules may be used, but this is only to allow time for both war plants and government to become geared for the more complete operation of the Manning Table Plan itself.

This brings me to the second of FACTORY's questions. I am asked to discuss the points in the current manpower situation which I wish to emphasize to industrial management. If I could somehow call informally at the office of every plant, and if there I were asked to give each management the best—and most detached—advice possible, these are the thoughts I would underscore:

1. It should be fully understood that *replacement schedules* (an extension to the Manning Table Plan—see page 79—*Ed.*) are a *temporary expedient*, and war plants should not regard them as lasting substitutes for manning tables. We *want* industry to prepare replacement schedules, to be sure. But we *expect* those war plants that do so to go right on with the work of preparing manning tables. Those who stop with replacement schedules may eventually be disqualified for the Selective Service consideration to which they are presently entitled.

2. The coming impact of Selective Service withdrawals on industrial personnel is *still* not generally realized. Employers *must* accustom themselves to the fact that, as the war goes on, the armed services will almost certainly claim every replaceable male employee of military age and fitness in every industry, regardless of its essentiality. *In any average plant, the prospective withdrawals of 1943 will probably be equal to the total of all previous withdrawals since the start of the war*—a sweeping statement, but I believe the facts will bear me out.

Now, what does this mean to management in terms of personnel policy? It can *only* mean: Train! Upgrade! Dig into the reserve sources for labor replacements! Remember, there are no permanent exemptions under Selective Service—there are only deferments. Government policy stands firm on this point. If, at the end of a deferment period, an employee is found doing the same job at the same level of skill, there is little chance that occupational deferment will be continued *whether or not trained replacements are at hand.*

So, call on Training-Within-Industry for help with training. Call on the United States Employment Service for

ARTICLES ON MANPOWER OUTLOOK IN THIS ISSUE

1. Statement (herewith) by WMC Chairman McNutt

2. Forecast of probable developments (page 77)

3. Details of new replacement schedules (page 79)

OWI photograph

"Train! Upgrade!" is Chairman McNutt's warning to management. "Dig into the reserve sources for labor replacements. . . . Prepare now to throw out of the window every last peacetime prejudice and restriction against the employment of older people, women, negroes, handicapped persons, and foreign-born workers"

potential replacements who can be trained. And prepare now to throw out of the window every last peacetime prejudice and restriction against the employment of older people, women, negroes, handicapped persons, and foreign-born workers.

3. Voluntary local manpower programs are coming rapidly to the fore. President Roosevelt's recent executive order, realigning the agencies under the War Manpower Commission, will have the highly beneficial effect of coordinating manpower activities at the local level. Military and industrial manpower requirements can now be synchronized within regions. And within regions management and labor can, by agreement, call a halt to unsystematic hiring practices—a necessary preface to the rational allocation of labor supply.

This opens more widely than before the opportunity for regional and area management-labor committees to develop local agreements to solve their local manpower problems. I need hardly point out that management has everything to gain from being represented in these influential posts by the ablest possible members. The individual management man owes it to himself to serve on these committees, if invited, and to give them the utmost cooperation and support. *A great deal depends on the caliber and prestige of the men chosen for these important committee positions.* They must be respected in their communities and they must have a thorough understanding of the local psychology.

4. Absenteeism looms as an increasing evil. I trust that every management will attack this problem directly in the plant. Health and safety programs must be expanded, and I can assure you that the War Manpower Commission will give such expansion every possible encouragement.

The plant advertising manager is a valuable ally in management's fight on needless absenteeism. His are the techniques of the year-round "selling job" urgently needed in almost every plant to register the point that regular attendance is an obligation which every worker owes to those who are fighting to preserve his freedom.

Manpower Trends

The following FACTORY forecast represents a composite of the off-the-record views of some of the most prominent officials of government and industry. FACTORY's Washington research included conferences with outstanding officials of the War Manpower Commission, the Selective Service System, the Labor Department, and the armed services. When speaking unofficially, these officials often disagree in their interpretations of events » » » To provide management with the most accurate possible forecast, FACTORY has sought to strike a balance of opinion. Right or wrong, the following pages indicate the way in which manpower trends appear to shape up at the moment

The Executive Order

President Roosevelt's Executive Order of December 5 had two important immediate effects and several implications of long-range significance. It reaffirmed and increased the authority of Paul V. McNutt as chairman of the War Manpower Commission and it put an end to voluntary enlistments.

McNutt can now clear up the jurisdictional jumble of agencies under his direction. He can now give orders to these agencies where formerly he could only issue directives. And he need no longer ask the permission of Congress to hire men at $4500 a year or over.

This leaves McNutt free to strengthen the staff of WMC and to rebuild the vital United States Employment Service (which had been threatened with disruption by turnover within its own ranks). He can then integrate regionally the major manpower agencies—USES, Training-Within-Industry, and Selective Service—under the WMC regional directors in whom he will vest marked operating responsibility.

The recall to the Army of Brig. Gen. Frank J. McSherry, WMC's former Director of Operations, deprives McNutt of an immensely valuable aide. Since McNutt is inclined to delegate authority about as thoroughly as any official in the government, the selection of McSherry's successor is of great significance. No final announcement has been made, but Arthur S. Flemming has been designated as Acting Executive Director and may retain the post. As a member of the U. S. Civil Service Commission, Flemming has made a name for himself in government circles for his administrative capacity.

As chairman of the important WMC management-labor advisory committee, he has become thoroughly familiar with the manpower program.

It is worth noting that the Executive Order does *not* increase McNutt's nominal authority over industry or the individual. It includes none of the basic elements of *total* manpower control which he outlined to Congress in his recent bid for manpower legislation. At the same time the Executive Order *does* improve his opportunity to apply *indirect* controls. Managements will find it more difficult to violate anti-pirating agreements without losing out on materials, housing, contracts, or transportation. Employees will find it more difficult to change jobs without "certificates of release" from USES.

Withal, McNutt's 1943 job is one of the toughest in the world. As the direct head of governmental agency staffs totaling well above 60,000 persons, he must add at least 3,000,000 Americans to war industry's payrolls while subtracting nearly 4,000,000 from civilian life through Selective Service. Without the ban on voluntary enlistments, the withdrawal process would have been chaotic. With it, the Manning Table Plan can be generally applied, and orderly withdrawals made.

Meaning to Management

So much for the government side of the picture. To management the Executive Order means (1) a pronounced drop in turn-over, (2) a chance to derive the full benefit of the Manning Table Plan, (3) a more rational relationship with the coordinated governmental agencies in the field. The regional management-labor advisory committees will give management, if ably represented, a fair voice in policy and procedure.

Exact statistics are unavailable, but it is estimated that voluntary enlistments have recently run as high as four to one over Selective Service withdrawals in many war industries. Patriotism has been one big factor. Too, young workers have sensed the inevitability of induction. This has stimulated the tendency to drift, to see the world, to get that extra few cents an hour for those last few weeks or months.

The quit rate in 11 selected war industries for September, 1942, was 4.81 against 2.62 for the same month of 1941. Samples show that a large majority of the drifters were employees of about one month's standing on the payrolls.

Plus the ban on enlistments, another element that should tend to cut down turn-over is the increasing prevalence of local "employment stabilization" plans (the latest, Detroit) which the newspapers usually describe as "job freezing." Basically these are employers' agreements, approved by labor, and are otherwise not dissimilar from

some of the "gentleman's agreements" which have prevailed in certain cities in the peace-time past. Real "job freezing" by definition would include severe direct penalties.

Impact of Selective Service

By present indications, Selective Service local boards will retain much of their local autonomy for the time being, even though Selective Service at the top has been subordinated to WMC on policy matters.

While monthly induction rates remain a military secret, there is every prospect that a boost in military quotas is in the offing. McNutt's prediction that the average plant will lose, through induction, as many men in 1943 as the total of those previously lost since the start of the war is probably conservative. *The day when practically every man of military age and fitness will be inducted is neither theoretical nor remote.* Few officials will say so publicly, but few will deny off the record that *dependency alone is just about through as a basis for deferment.* Hence the new prominence of the 3-B classification (combining dependency and essentiality) which will have prevailing significance until the emphasis shifts completely—as it must—to replacement training time.

Meanwhile, the lowering of the draft age limit to 38 would tend to intensify slightly the strain on the age groups between that figure and 20. But the inclusion of men 18 to 20 will ease it considerably for the present. At all events, the burden will fall finally with greatest weight on the group between 20 and 30. Some studies have shown that only about 30 to 40 percent of men over 30 are likely to prove physically fit for military service.

Upgrading Inspectorate

Among the numerous more spectacular manifestations of total manpower control which have been discussed in recent months is the creation of a force of inspectors to visit plants and make sure that manpower is not being hoarded. Stated in such terms it seems a fearsome thing.

Actually WMC has moved to create a small force of industrial analysts. They will visit plants at WMC's direction, but will be without police powers. It will be their duty to study the use made of plant personnel and to recommend changes wherever they see an opportunity to conserve manpower through upgrading, and more efficient methods. According to present plans, these men will be accompanied throughout their visits by a representative of the management and one of the union, if the plant happens to be organized.

The objective appears to be a thorough inspection of a few plants rather than a casual inspection of many. Long-range, it suggests a practical attack on restrictive practices as well as any labor "hoarding" that may happen to exist. By and large, WMC officials do not seem to believe that there is need for grim punitive expeditions by large staffs of hide-bound and suspicious inspectors

Future of Manning Tables

All the foregoing is evidence of the now generally acknowledged belief that the Manning Table Plan (See FACTORY, November, 1942) will be generally and voluntarily adopted by the war and essential industries without, in all probability, ever being made mandatory.

The fact that Selective Service procedures at the local board level seem likely to remain unchanged simply reemphasizes management's crying need for the orderly withdrawal protection which the Manning Table Plan affords. Note McNutt's warning (see page 75, this issue) that the new interim replacement schedules are in no sense a lasting substitute for manning tables.

Essentiality—Eligibility

As a matter of evolution, the widespread adoption of the Manning Table Plan will eventually form new definitions of essentiality in industry. Companies eligible to participate in the Plan will get first consideration from the local draft boards when they submit their 42-A or 42-B requests for deferment bearing manning table (or replacement schedule) acceptance stamps.

Such companies will thus have established their practical essentiality by a definition far more cogent than any contained in the occupational memoranda of the past. Companies whose business volume is 75 percent or more on direct war work are automatically eligible for manning table participation. For other companies, the question is still wide open. The WMC's announced list of 35 industries which may file replacement schedules does not necessarily embrace all those that may be eligible for manning table participation.

The power to accept or reject manning table applications rests in the hands of the WMC regional directors. No appeal from their decisions is currently provided. They have been given no rule of thumb (except the examples of "railroads, utilities, etc.") and their only instructions are to "use their heads." An example of the way this is working out in practice would be a dairy company which obtained manning table approval without difficulty for its milk and food producing units, but after some discussion made no attempt to file manning tables for its ice cream division.

Companies that feel some doubt about their own eligibility should prepare now to present the best case possible if they intend to file manning tables. A factor which will undoubtedly weigh with the WMC regional chief will be the company's priority status in the materials field. Here again new definitions will take shape as the Controlled Materials Plan goes into effect. It is likely that there will be a definite, if informal, connection between eligibility under CMP and eligibility to file manning tables.

Legislation—Single Hiring

When Congress reconvenes, the talk of manpower legislation will probably be revived. Indirect controls will have to suffice for the present, but they will probably prove inadequate if the "crisis period" in labor supply develops quickly. Then WMC will need—and probably get—legislation permitting it to deprive non-essential industries of skilled help, to assign workers arbitrarily from job to job, and to force industry to rely solely on the USES for its labor supply by the process commonly called "single hiring."

Of the three, "single hiring" is undoubtedly the farthest away, if only because USES will take so much time to build up to the task. The important function of plant employment offices in recruiting new replacements from reserve labor sources makes their continuance essential.

Replacement Schedules

REPLACEMENT SCHEDULES do *not* replace manning tables. Normal procedure is for the employer, after preparing manning tables, to draw up a replacement schedule to direct him in upgrading, promoting, and recruiting replacements for workers who, according to the compiled information, will soon be inducted.

It will take a few months, however, to get the manning tables into operation. Meanwhile, looming inductions may create situations in some plants that require immediate action. Pending completion, therefore, of manning tables, and to offer a temporary solution in such cases, replacement schedules will provide a basis for withdrawals and replacements. Forms may be obtained from the State Directors of Selective Service.

First step in preparing a replacement schedule is to secure the following information from each male employee in the plant: (1) Job title, (2) date of birth, (3) local board number and address, (4) Selective Service order number and classification, and (5) family relationships.

Next the employer prepares a replacement summary (see illustration). He lists jobs by plant departments or other operating units. Opposite each job he lists total number of workers under the following headings: (1) Number of women, (2) number of

REPLACEMENT SUMMARY

List of Jobs – Selective Service Status of Workers

Company ..... Date .....19.....

Plant ..... Signed .....

Location ..... Title .....

Line No. or Code	LIST OF JOBS (Job Titles)	Number of Women	Number of men not now to be considered for replacement					Number of men to be considered for replacement			Total of All Workers	Anticipated Maximum Number of Workers (Optional)
			Men With Minor Children	Class 4-F	Over Age	Under Age	Total	Single Men	Married Men Without Children	Total		
1	2	3	4	5	6	7	8	9	10	11	12	13
	DETAIL MFG. DEPT. MACHINE SHOP											
	Foreman		5		2		7		1	1	8	
	Sub-Foreman		6	1	3		10	2	3	5	15	
	Leadman		19	1	9		29	6	2	8	37	
	Milling Mach. Opr.		20	2	15		37	10	11	21	58	
	Automatic Screw Mach. Opr.		10	2	6	1	19	8	21	29	48	
	Engine Lathe Opr.		7	3	7	3	20	27	11	38	58	
	Drill Press Opr.	42	20	5	10	61	138	32	41	73	211	
	Assembler "C"	824	550	69	179	231	1,853	237	294	531	2,384	
	ENGINEERING DEPT.											
	Chief Engineer				1		1				1	
	Adminis'tive Engineer		1				1				1	
	Project Eng'r		3		1		4		1	1	5	
	Layout Draftsman		16	2	12		30	8	14	22	52	
	Detail Draftsman	38	15	11	21	13	98	61	41	102	200	
	Expediter		3	1			4	1	1	2	6	
	Stock Clerk		4	1		1	6	3	5	8	14	
	Stock Chaser		4	1		3	8	11	8	19	27	
	TOTALS	4,515	3,403	422	1,797	1,290	11,427	1,643	1,772	3,501	14,928	

REPLACEMENT LIST

List of Employees – Anticipated Replacements per Month or Period

Company ..... Date .....19.....

Plant ..... Signed .....

Location ..... Title .....

Line No. or Code	Job Title	Name	Year of Birth	Sel. Service Class	Married or Single	Local Board No., County, State	Order No. (opt.)	We will be prepared to replace these men within the month or period checked below							
								1st	2nd	3rd	4th	5th	6th	6 to 12 Mos.	Over 12 Mos.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	DETAIL MFG. DEPT.														
	MACHINE SHOP														
1	Foreman	Smith, John R.	'04	II-B	M										
2	Sub-Foreman	Jones, Thomas L.	'09	III-B	S										
3		Wilson, Jeffry B.	'12	III-A	S										
4		Bradon, John R.	'11	II-B	S										
5		Waite, Tim	'17	II-B	M										
6		Mann, Joseph W.	'17	II-	M										
7	Leadman	Nichols, Roger	'15	III-A	S										
1463		Colgan, Douglas	'22	Uncl.	M										
	ENGINEERING DEPT.														
1464	Project Engr.	Evans, John T.	'99	III-B	M										
1465		Allan, B. C.	'07	II-B	S										
1466	Layout Draftsman	Martin, Chas.	'09	II-B	S										
1467		Park, Franklin	'09	III-A	M										
1468		Davis, Donald K.	'14	II-B	M										
3499	Expediter	Furman, Oliver S.	'14	II-B	S										
3500		Winter, Wm. C.	'17	III-A	M										
3501	Stock Clerk	Honan, W. H.	'21	I-A	S										
		TOTALS						167	100	100	100	150	150	125	1484

men not to be considered for replacement, (3) number of men to be considered for replacement.

The replacement summary thus presents a condensed schedule of the jobs and workers in the plant, and forms the basis for preparation of the replacement list.

Men to Be Replaced

Sample replacement list (see illustration) shows how this form is filled out. Note that it lists only those men who are listed on the summary under the heading, "number of men to be considered for replacement." In other words, it includes only single men and men without children who are within the age groups liable, or who within six months will become liable, for military service. Each man who is to be considered for replacement is listed by: (1) Job title, (2) name, (3) year of birth, (4) Selective Service classification, (5) family status, (6) number and address of local board. Check marks show when the employer will be prepared to replace each of these men.

On completion, replacement schedules are submitted to the State Director of Selective Service for acceptance. If the latter, upon review, considers that the employer is providing for the replacement of registrants in a manner consistent with Selective Service policies, he assigns to the employer a state acceptance number. An approved schedule continues in operation for six months.

Manning Table Data

For complete instructions in the preparation of manning tables, the reader is referred to FACTORY's November article, "The Manning Table Plan." Reprints of this article for the use of plant operating personnel are available in any quantity at 5 cents a copy. Address: Editor, FACTORY, McGraw-Hill Publishing Company, 330 West 42nd Street, New York, N. Y.

How Group Bonus Works

Happens to be in a wood box shop. But the same principles apply, no matter what the industry. Here are details, including standards on which plan is based

PHILIP BERNSTEIN, Department Head, Time Study, Winchester Repeating Arms Company, New Haven, Conn.

WE BELIEVE that incentives rank next to labor-saving machinery as a means of reducing costs and increasing output. Therefore a group incentive plan for direct and indirect labor has been installed in several departments of our plant. Our wood box shop makes thousands of packing cases for ammunition, shot guns, rifles, batteries, flashlights, and all kinds of non-repetitive special jobs. It is practically impossible to set individual piecework rates for the various operations because of the vast amount of clerical work that would be involved in keeping track of the work of each individual.

For instance, a plan was devised, similar to the cost per task plan, in which we get the time for processing a case from beginning to end and then convert the time from minutes to points, allowing for indirect and non-productive time. The formula then is $M = P \times \frac{MH}{PH}$, where M stands for minutes, P for points, MH for man-hours per day, and PH for productive hours per ray.

At the end of a calendar week, points and man-hours are totaled. If $\frac{P}{MH}$ is greater than 60, a bonus of one-half the excess above 60 expressed as a percentage of 60, is paid to each member of the group in addition to his base rate, which is guaranteed.

The base rate is set for the job classification, which can be altered to reward an individual who is outstanding, or penalize one who has to be transferred from one classification to another.

Each operation is first time-studied so that standards can be established. Then it is necessary for the shop only to request the point value for any new case or other product that comes up, giving the dimensions, and stating whether the case is to be printed, assembled, or delivered in shooks to the warehouse or other destination. Within an hour, the time study section has the point value determined and has authorized the rate.

Standards for First Resaw. Lumber comes from the vendor as either 1¾ or 2⅛ round edge, and averages 130 inches in length and 8 inches in width. The 1¾-in. lumber can be sawed into two ⅛ planks, or four ⅜ planks, or one 1⅛ and one ⅛. The 2⅛ can be resawed into one 1⅛ and one ⅛, or one 1⅜ and one ⅜. The Plank widths by percentage are shown in Table 1.

TABLE 1

Width	*Percentage*	*Width*	*Percentage*
4	11	12	6
5	14	13	4
6	14	14	3
7	10	15	1
8	9	16	2
9	10	17	1
10	9	18	1
11	7		

The time for resawing a 130-in. plank is 0.268 minute.

Planing. When the lumber is sawed into two halves, the planks are immediately planed to the required thickness in a double planer. When the resawed thicknesses are different, one plank is immediately planed to the required thickness and the other portion is laid aside for future use.

The time for planing a 130-in. plank is 0.192 minute. However, when it follows sawing, 0.268 minute must be allowed, because the resaw time is the governing time.

Roughcut to Length. Each of two men takes an alternate plank from the planer and cuts it to length or multiple length on a swingsaw and pre-positions it for the following operation. It takes 0.04 minute to swingsaw to length. The group has agreed that one man can do the roughcut instead of two, thereby saving man-hours without losing points.

Edge and Rip to Width. This operation is performed by two men, one feeding the board and the other putting away on a truck. When finish width is to be less than 3 inches, the boards are edged only, as there is no time for ripping. When boards are to be finished between 3 and 6 inches, they are edged and ripped when wide enough. Finishing between 6 and 9 inches wide requires that a certain percentage of the boards must be fitted and matched. Boards finished 9 inches and over are edged only, and fitted and matched 100 percent. Edging times are given in Table 2.

TABLE 2

Length in Inches	*Time in Min.*	*Length in Inches*	*Time in Min.*
up to 13	.03	37	.0675
14	.0325	38	.0685
15	.0345	39	.070
16	.0365	40	.071
17	.039	41	.0725
18	.04	42	.0735
19	.041	43	.0755
20	.043	44	.077
21	.045	45	.077
22	.047	46	.078
23	.048	47	.079
24	.0495	48	.08
25	.051	49	.081
26	.0525	50	.082
27	.054	51	.084
28	.0555	52	.0845
29	.0565	53	.0855
30	.058	54	.0865
31	.0595	55	.088
32	.061	56	.089
33	.0625	57	.09
34	.0635	58	.091
35	.065	59	.092
36	.0665	60	.093

Note—When ripping after edging, use 80 percent of the above times, because of shorter make-ready time.

(Continued on page 190)

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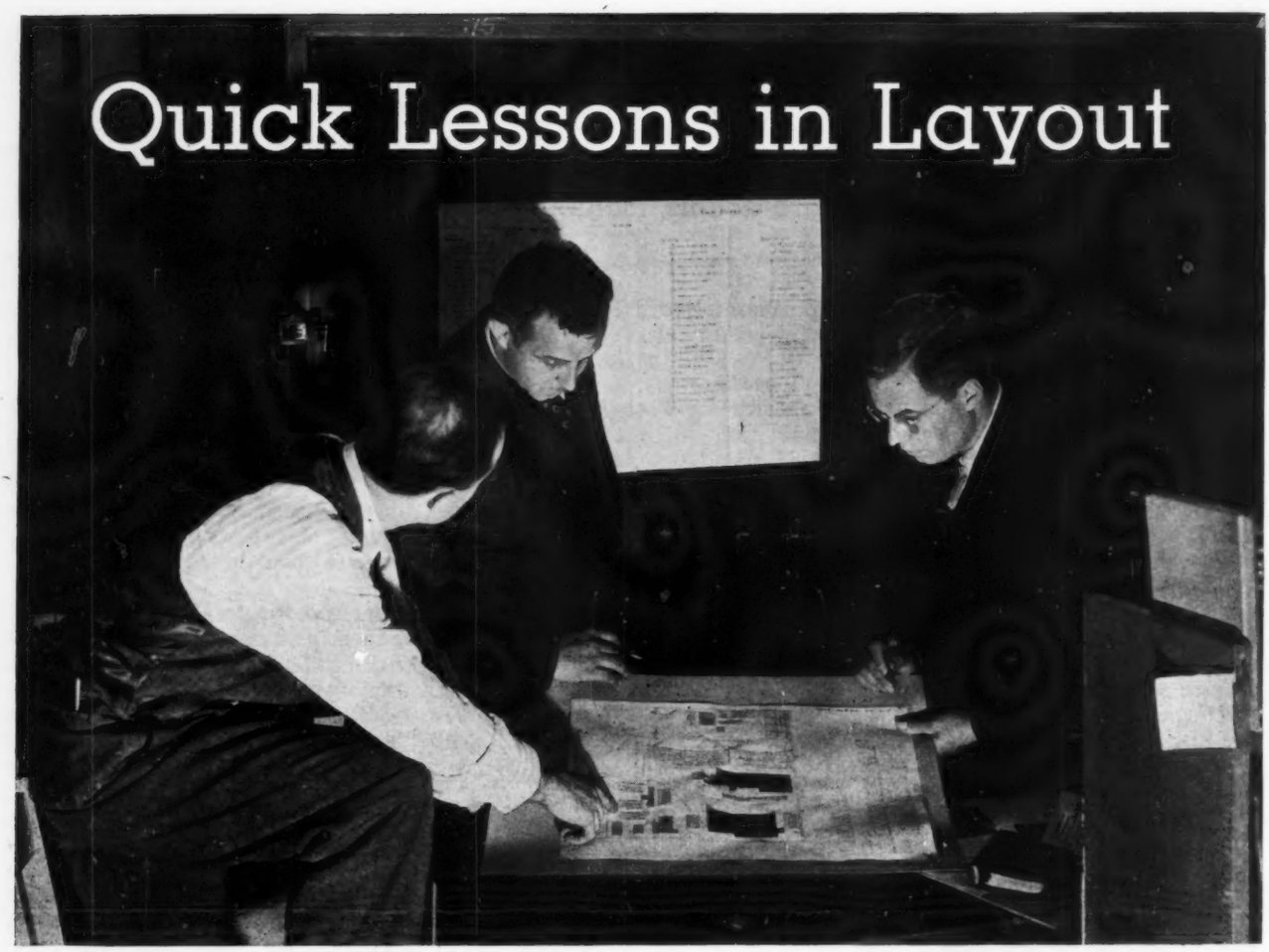
Quick Lessons in Layout



Layout men at Paraffine Company discuss a suggestion from the class. Left to right, T. L. Morrill, assistant plant manager, author W. L. Maffey, and Rowland F. Sweet, materials handling engineer

Industry is so short of layout engineers that it's train—or else! Here is a quick course that trains men in layout fundamentals, and does it in 30 hours' time

WILLIAM L. MAFFEY, Industrial Engineer, Paraffine Companies, Inc., San Francisco

PROCESS CHARTS and standardized layout procedure can be used profitably—and with a minimum of instruction—by the average plant operating man, in redesigning for a new product.

We proved this recently in a federally sponsored training course with the lengthy but descriptive title of "Plant and Equipment Layout for Production." It was one of the many currently sponsored by the United States Office of Education under the Engineering, Science, and Management Defense Training program. As with all ESMDT courses, its purpose was to help fill the shortage of specifically trained engineers and executives in war industries.

Already a number of Paraffine executives had served as instructors in previous ESMDT courses. Our plant has had a steady growth for years, and we found it essential long ago to use layout groups and the standard tools of the layout engineer to achieve efficient production. So T. Leonard Morrill, assistant plant engineer, and the author were assigned as instructors. We operated under supervision of the University of California Engineering Department.

Caliber of the men who took the course was good. The plant manager of one of the largest diesel engine manufacturers on the coast signed up, and we had the assistant manager of a large grain milling plant. Another of our students was a consulting engineer; still another was a layout engineer for a conveyor manufacturer. Most of them however were young engineers typical of the plant man who is responsible for re-layout in war manufacturing plants.

After outlining fundamentals of plant layout, such as procedure in getting basic information, determining plant capacity, and making process charts, we looked around for an actual case study. Total time for the course was only 30 hours, so we had to find a relatively simple problem. We discovered it in the head-spool manufacturing department of our company. The product involved was simple, being an assembly comprising a wood plug, one plywood disk, and three felt disks. This assembly is used to insert in the ends of floor-covering rolls to protect them during shipment.

The method of manufacture left much to be desired. We had quite recently developed the header spool as the key part of an assembly to supplant wood crates, and because our first objective was to get into production with existing machinery we had not touched the layout problem. Machines used were a power-feed ripsaw, a crosscut saw with a carriage designed to handle long stock, a 6-ton punch press, and a shear of the paper-cutter type. A bench equipped with jigs was used for assembly. Also available but not used at the time were a 2½-ton punch press and an 8-head nailing machine.

Method of production can be seen in the operation process chart. As a glance at the original layout will tell, there were many inefficiencies, such as long distances between operations, material cross-overs, and wasteful methods in machine operation. The department had originally been designed for diversified work such as fabricating asphalt drums, making boxes and crates, and resawing asphalt shingle covers. The machinery was naturally spread out over a wide area of the shop.

Class Gets the Facts

We put it up to the class. They were given the basic data, including the production rate of 1500 units per day, plant area available, area occupied by each machine, present manufacturing costs, and quality standards. Then they constructed operation and flow process charts preliminary to making scale layouts. As was to be expected, the flow process charts revealed a great many more faults than those mentioned above.

Then the class went to work with colored cardboard, scale paper, scissors, colored string, and rubber cement. Machines, storages, and conveyors were indicated by cardboard templets of different colors. After a layout was completed, it was tested by the spring-and-pin method. Flow of each of the three materials was traced by running string from one work station to the next. We used round-headed tacks to fasten the string. Different colored string was used for each material.

On the first layouts the strings in nearly all cases suggested a maze running at every conceivable angle and crossing back and forth. But after a lot of hard work the students had them refined to the point where the testing method showed reasonably efficient flow of material.

An excellent example of the type of improved layout turned out is shown on page 87. This particular layout utilizes all the available machines to good purpose, and achieves fast production with a minimum of special equipment. Key to the success of this layout is the use of gravity-roller, power-belt, and wheel-type conveyors, thereby eliminating hand transportation except on once-a-day operations, and solving the temporary-storage problem.

Taking the operations step by step, the layout functions as follows: Round plug stock is wheeled from yard storage in a specially constructed cradle to a position alongside the crosscut saw. Twenty-five empty toteboxes, sufficient to handle the day's produc-

BASIC INFORMATION
Header Spool Manufacturing

1. Purpose of study - to provide a detailed layout for header-spool manufacturing

2. Time available - three class meetings

3. Cost limitations - $5000 for construction and equipment purchase

4. Manufacturing cost - $0.15 each

5. Quality standards - plug to be centered in disk to plus or minus 1/16 inch; nailed securely to withstand edge impact; plug of good material; 1/2-in. plywood disk; standard felt

6. Workmanship - rough

7. Production requirements - 1500 per day

8. Possible future requirements - 6000 per day

9. Seasonal trends - fairly constant

10. Raw materials - No. 3 grade 4x8-ft., 1/2-in. plywood sheets; 20-ft. plug stock with 4 1/4-in. maximum O.D. allowed, 4 3/16-in. minimum; cement-coated 8d box nails; standard roofing rag felt

11. Basic process - involves use of simple woodworking machinery, punch presses, etc. Punching disks with die has proved most feasible

12. Storage area requirements - plywood received by box-car load, with each car loaded to a space of 7x10x40 feet. Plywood weighs 2 pounds to board foot. Plug stock available from local mill supply, in any desired quantity. Nails received in standard 100-lb. kegs. Felt received in 500-lb. rolls, with three rolls ordered at one time

13. Equipment - special crosscut saw, 18x27 punch press, 12x18 punch press, nailing machine, shear, and nailing bench. Dimensions as given in class, including actual machine area and work areas

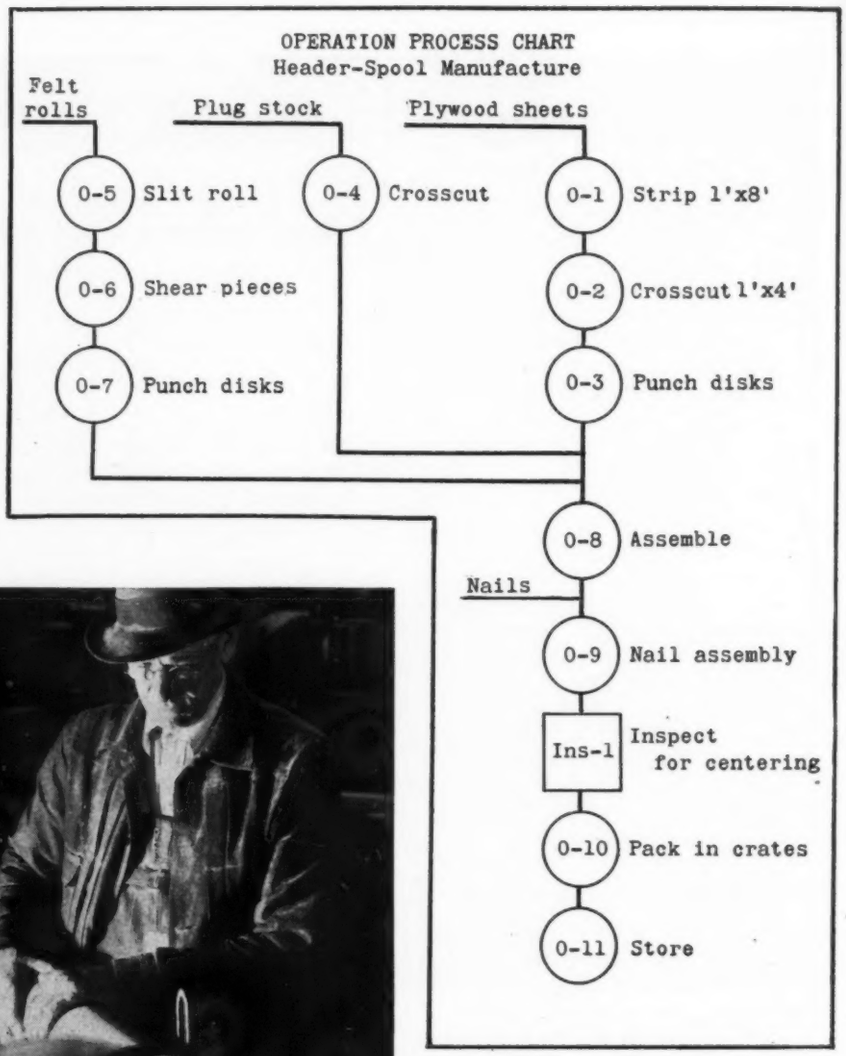
14. Wages - saw operators, $1 per hour; punch press operators, $0.98 per hour; assemblers, nailers, and packers, $0.85 per hour

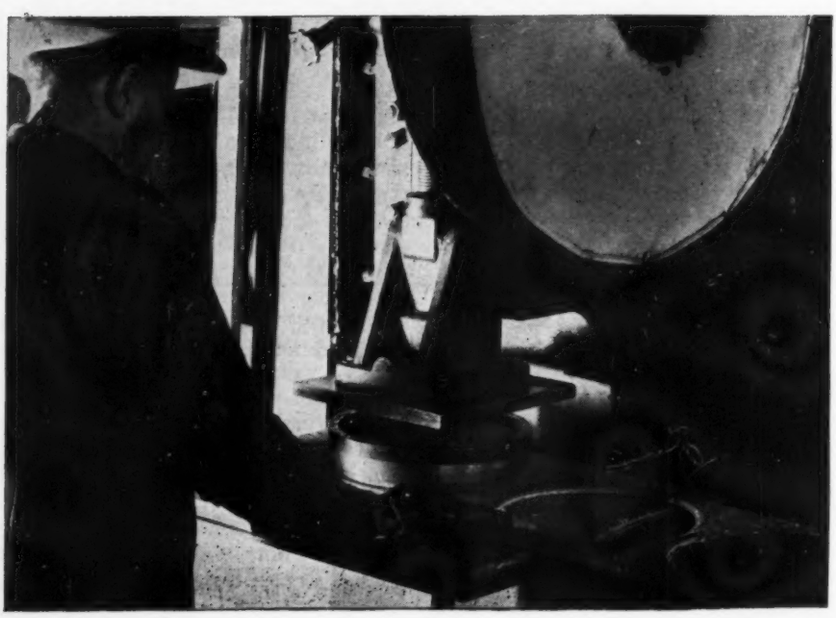
15. Work standards - Ply disk - 288 units per man-hour; one-man crew; unit cost, $0.00341. Felt disks 620 per man-hour; one-man crew; unit cost, $0.00158. Crosscutting plugs - 400 per man-hour; three-man crew; unit cost, $0.0024. Stripping ply - 123 units (1x4-ft. units were used here) per man-hour; two-man crew; unit cost, $0.0075

From these basic data the class in plant layout constructed operation and flow process charts preliminary to making scale layouts

tion of 1500 plugs, are brought in on a flat. Eight are unloaded on the storage end of a gravity-roller conveyor which passes underneath the saw. Empties are held in place for loading by a foot-operated stop. After the plugs are cut to length, they fall into a chute which carries them to the totebox. The filled totebox is released and passes to the assembly bench via gravity rolls and a booster section.

Plywood sheets for disks are trucked on flats to the power-feed ripsaw, where they are cut into strips. Each strip, as it is cut, falls into a receiving trough located conveniently for the next operation. The punch press operator picks up two at a time and feeds them into the 6-ton press.

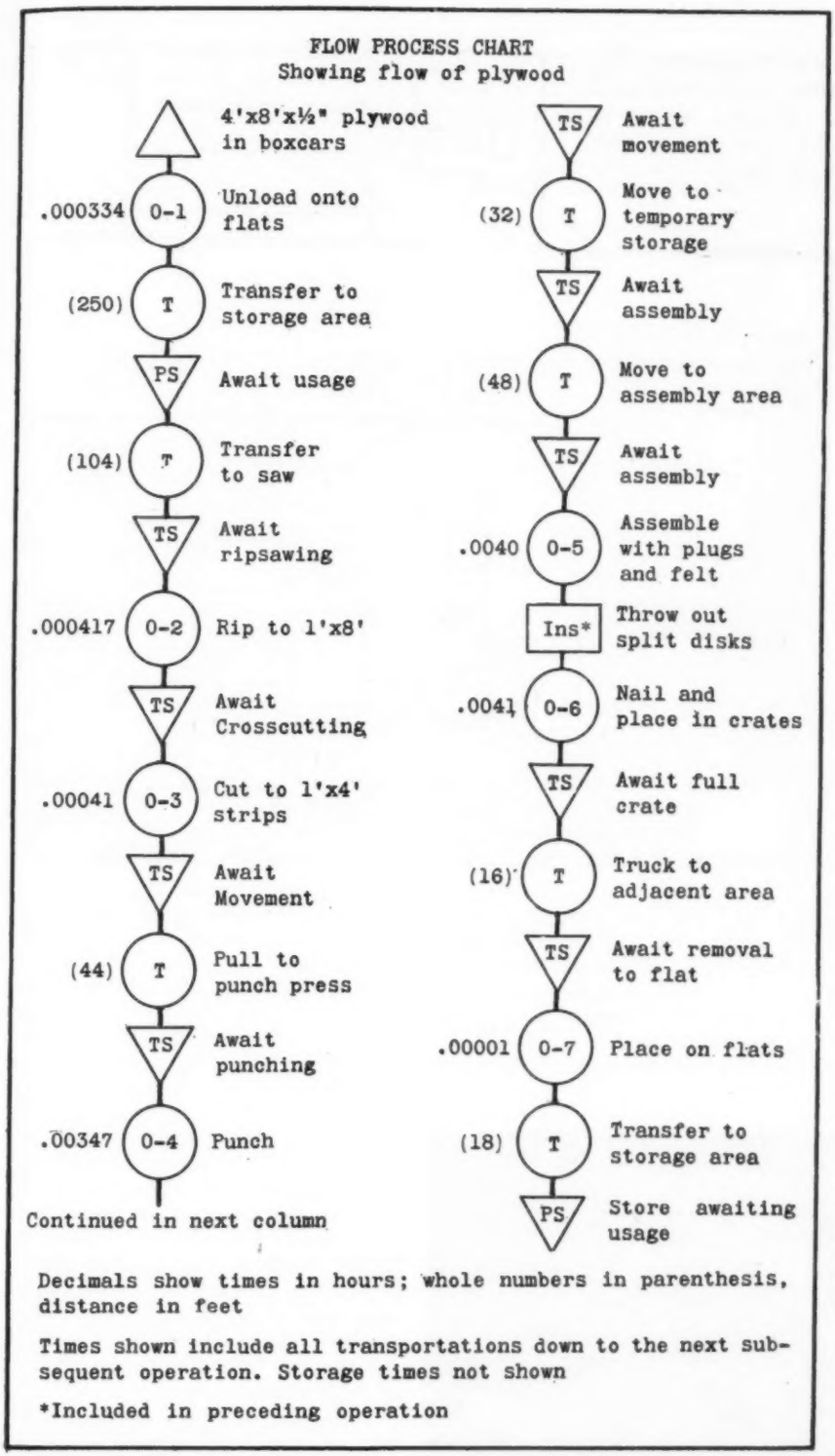




First step towards new layout was the construction of an operation process chart (above). Crosscut saw (top left) was one of the pieces of existing equipment. Improved method of using punch press (bottom left) provides for continuous drop delivery through the bolster plate, instead of knocking disks out of die by hand

Two innovations in the press operation might be mentioned here. Under the present method, the die is placed on top of the ply sheets by the operator, the punch is actuated, and then die and material are re-positioned for the next cut. After three punches are made, the disks must be knocked out by hitting them on a mandrel. The new layout, however, allows cutting a hole through the bolster plate and fastening the die to the bed so that after it first becomes full, each new disk as it is punched will automatically knock the bottom disk out of the die.

This method was suggested by a


FLOW PROCESS CHART
Showing flow of plywood
4'x8'x½" plywood in boxcars
.000334 O-1 Unload onto flats
(250) T Transfer to storage area
PS Await usage
(104) T Transfer to saw
TS Await ripsawing
.000417 O-2 Rip to 1'x8'
TS Await Crosscutting
.00041 O-3 Cut to 1'x4' strips
TS Await Movement
(44) T Pull to punch press
TS Await punching
.00347 O-4 Punch
Continued in next column
TS Await movement
(32) T Move to temporary storage
TS Await assembly
(48) T Move to assembly area
TS Await assembly
.0040 O-5 Assemble with plugs and felt
Ins* Throw out split disks
.0041 O-6 Nail and place in crates
TS Await full crate
(16) T Truck to adjacent area
TS Await removal to flat
.00001 O-7 Place on flats
(18) T Transfer to storage area
PS Store awaiting usage
Decimals show times in hours; whole numbers in parenthesis, distance in feet
Times shown include all transportations down to the next subsequent operation. Storage times not shown
*Included in preceding operation

Flow process chart made by the students showed up the time-wasting faults of the current method. There were too many temporary storages, and long distances had to be traveled in handling the material

class member during a visit to the header-spool department. It will save two-thirds of the time formerly consumed. We consider it typical of perhaps dozens of similar improvements that can be made in the average plant by the exercise of a little thought in work simplification.

The other innovation in this layout is the installation of a short gravity-roller section at bed level to lessen the effort necessary to handle the 8-ft. plywood strips.

To go on with the punch press operation—the operator has, at the beginning of the day, moved in 25 toteboxes on a flat and placed one in the receiving position beneath the press. When 60 disks are punched, he places the box on an adjacent conveyor section and it is taken to assembly on gravity-roll and booster sections.

The 2¼-ton punch press was put into service in this layout to handle the job of punching the felt disks. The operator rolls a bolt of felt up close to the shear, slits it, and cuts a 2-in. layer into 1x3-ft. bundles. These bundles are piled on a table adjoining the press. The same arrangement of the die in the bed of the press has been made here as in the 6-ton unit, and felt disks fall automatically into a totebox beneath the press.

No Conveyor Storage

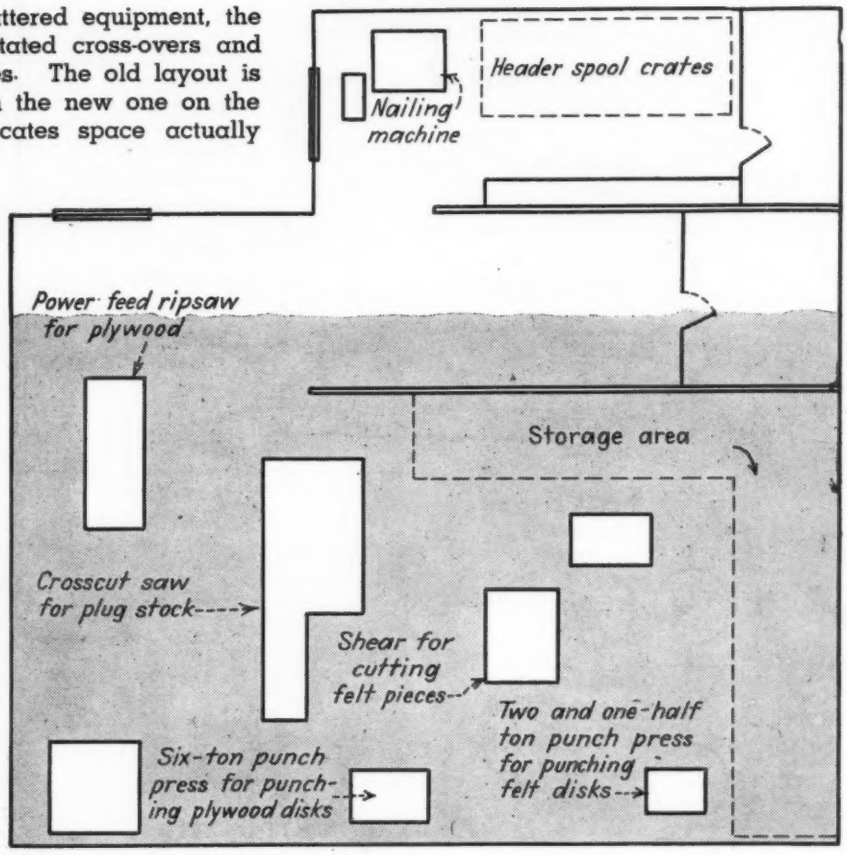
As at the larger press, too, the operator has access to a flat of 25 toteboxes. As they are filled, he places them on a gravity conveyor leading to the assembly point. It will be noted that in both punch press operations the operator must get an empty box from the flat when the preceding one is filled, and then lift the filled box from its position below the press to the conveyor. At present it seems doubtful that it would be worth while to provide conveyor storage for the empty boxes, although it might prove profitable in lessening fatigue.

Although the course was necessarily confined pretty well to the mechanics of actual plant layout, a number of the members did independent research into work simplification. As a matter of fact, we found the two subjects so closely allied that we gave work simplification some attention during class discussions.

As shown in the new layout, all three parts of the header spool converge on conveyors at the assembly station, enabling the operator to reach them conveniently. First the assembly operator places the plug in the bottom, then two pieces of felt, a plywood disk, and finally one piece of felt. Then the jig goes to the nailer.

Around this idea a conveyor was designed with two rows of wheels spaced so that the portion of the jig containing this plug rides down between them and the portion containing the disk rides on the top of them. The conveyor is in the form of a U, with the assembly operator inside it and the ends terminating at either side of the nailing machine. The assembly operator has a storage bank of empty jigs to his right. They are held in place by a piece of light spring steel. His first step is to release a jig with his right hand while his left hand is getting a plug. The next two moves are simultaneous. The left hand se-

Old layout. Characterized by scattered equipment, the header spool department necessitated cross-overs and needlessly long handling distances. The old layout is shown here to smaller scale than the new one on the facing page. Shaded area indicates space actually occupied by the new layout


Header spool crates
Nailing machine
Power feed ripsaw for plywood
Storage area
Crosscut saw for plug stock
Shear for cutting felt pieces
Two and one-half ton punch press for punching felt disks
Six-ton punch press for punching plywood disks

cures a plywood disk, the right, a felt disk. Then once more both hands move almost at once, the right picking up two thicknesses of felt and dropping them into the jig, the left grasping the jig and pushing it around the curve. From this point it reaches the nailer by gravity.

Another feature of the assembly set-up has been incorporated at the terminus of the three material conveyors. Here the last 2 feet of conveyor rails are sloped downward to allow the assembly operator to get the material without an excess of effort. Then, as each totebox is emptied, the operator removes it and places it on the conveyor section at left leading to a storage bank. At the end of the day these toteboxes can be gathered up, placed on flats, and trucked to their respective starting positions again.

The nailing operation is pretty well indicated in the description of the assembly set-up, but again it is the work simplification slant that makes it particularly interesting. The nailer reaches for a full jig with his right hand and slips the jig into a fixture on the nailer to receive it. After the nails are driven, the operator's left hand removes the jig as his right hand reaches for another to feed the nailer. The left hand then turns the jig upside down over the wheel conveyor leading to the packer and dumps the assembled spool. The empty jig is returned on the U-shaped conveyor to the assembly operator.

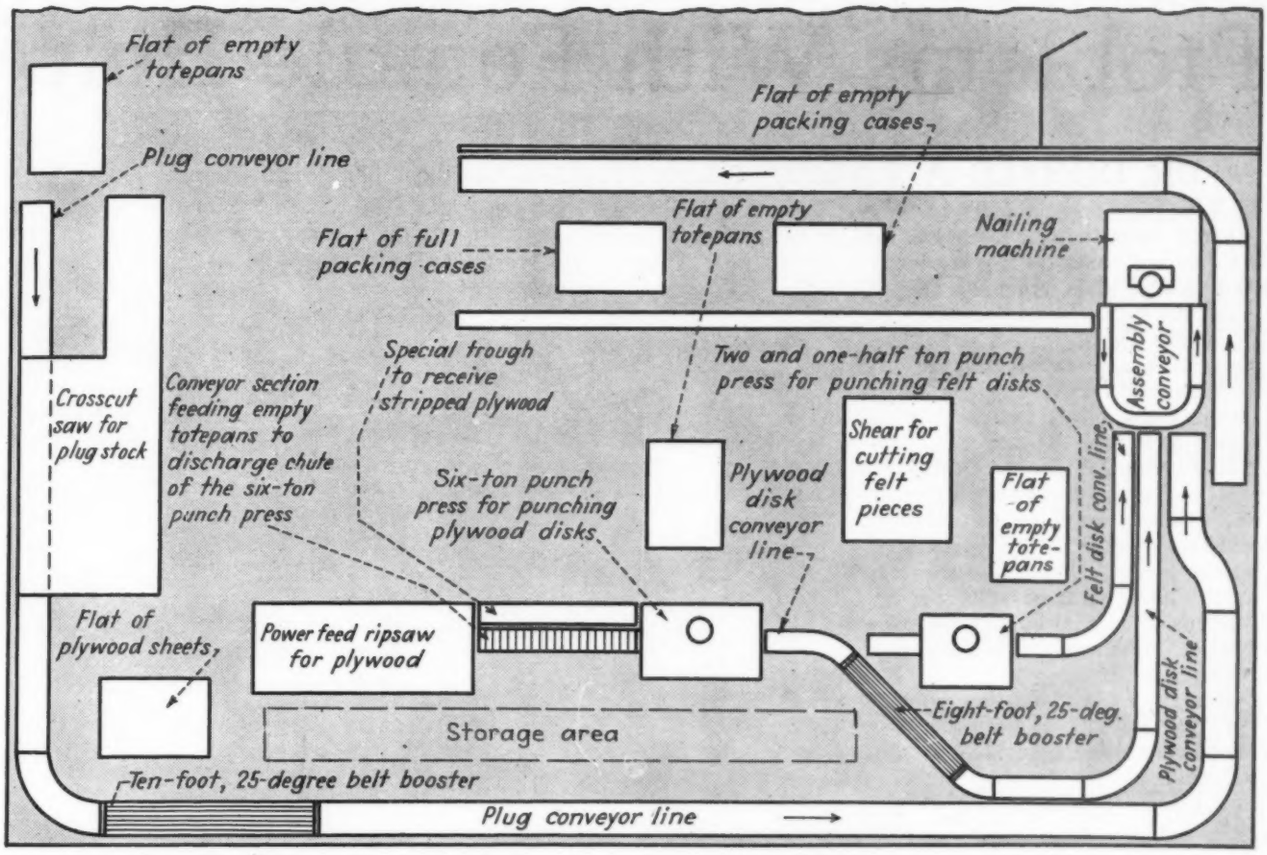
Packing is done alongside the wheel conveyor. Two flats are provided, one for empty and the other for full packing crates.

In estimating cost data for this particular layout, the standards originally given the class were disregarded. Reason for this was that the standards for each machine included all supplementary steps, such as handling, and most of these have been streamlined. However, all available information was used in forming the new standards, such as rated speeds of machines, approximate distances to be covered by the operators, and operator movements. On the basis of these data, a labor cost of $0.0102 per spool was set up. Breakdown of this cost is given in the tabulation shown on the opposite page.

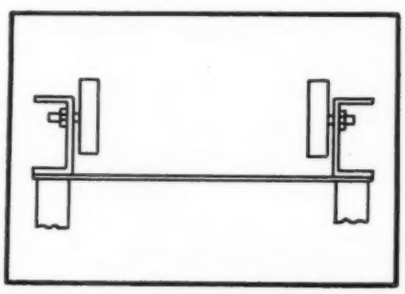
As will be suggested by the shortcuts offered in this layout, this cost is exceptionally low. The layout has the advantages of flexibility, for without change it could handle nearly 6000 header spools in an 8-hour day. The time-consuming factors of handling material manually over long distances, of having many temporary storages, and of waste motions, have been eliminated.

The actual layout, too, was solved in different ways by individual members. One roughed out a continuous production machine which automatic-

Nailing machine, with workplace laid out according to work simplification principles, has replaced the old hand assembly method


Flat of empty totepans
Plug conveyor line
Flat of empty packing cases
Flat of full packing cases
Flat of empty totepans
Nailing machine
Assembly conveyor
Special trough to receive stripped plywood
Two and one-half ton punch press for punching felt disks
Crosscut saw for plug stock
Conveyor section feeding empty totepans to discharge chute of the six-ton punch press
Six-ton punch press for punching plywood disks
Plywood disk conveyor line
Shear for cutting felt pieces
Flat of empty tote-pans
Felt disk conv. line
Flat of plywood sheets
Power feed ripsaw for plywood
Storage area
Eight-foot, 25-deg. belt booster
Plywood disk conveyor line
Ten-foot, 25-degree belt booster
Plug conveyor line

New layout. Shown here to larger scale, the new header spool assembly layout actually occupies less floor space than the old. See shaded area in the old layout reproduced on the facing page



Assembly operation has now been completely mechanized. Here, section of spool conveyor

ally glued the felts to the ply and fed the complete sheet into the punch press, making a two-piece instead of a five-piece assembly.

Every member of the class had an idea that in some way represented a distinct improvement. We think most of the members have returned to their own jobs with a good groundwork for application of scientific layout practices. We believe that this will be translated into improved production in a number of plants producing the materials and products that will mean ultimate victory.

COST ESTIMATE

Header Spool Manufacture

Item	Rate per Hour	Total Time	Hourly Rate	Cost per 1500 Spools
Plug cutting	720 plugs	2.08	$1.00	$2.08
Rip ply	112 strips (900 blanks)	1.66	1.00	1.66
Punch ply	720 disks	2.08	.98	2.04
Shear and punch felt disks	1500 blanks (4500 needed)	3.00	.98	2.94
Assemble	720 units	2.08	.85	1.76
Nail	720 units	2.08	.85	1.76
Pack	720 units	2.08	.85	1.76
				14.00
Contingency for error in times, 10 percent				1.40
Total estimated cost, 1500 header spools				15.40
Total estimated cost per header spool				$0.0102

Breakdown of header spool manufacturing cost as established by the new data shows it has been cut from 15 cents to 1 cent each

Problems With Female Help

DR. DONALD A. LAIRD, Industrial Psychologist, Middle Haddam, Conn.

WOMEN are taking over many jobs for the duration. Industry is going to see a lot more of them in coming months —and not in the Minsky sense.

The fair sex will make a good showing, and a real contribution to our war effort in an active way, whether in keeping the home fires burning or the wheels of industry turning.

How effective their contribution will be, depends greatly upon how industry adapts itself to the different problems posed by the inrush of woman power. Every employer should start thinking of these problems now if we are to have optimum production with a minimum of trial-and-error adjustments.

Here is a hatful of the problems that will be raised, and which we should start thinking about—or doing something about:

1. What work do we have that could be done by women?

2. Women are more sensitive to the appearance of their surroundings. Will improved housekeeping in the plant or office pay a production dividend with them?

3. Women are especially sensitive about their own personal appearance. Can we have working garb for them that is attractive yet efficient, and will not make them dispirited?

4. How can we educate them to come to work, and thus avoid idle machine-hours, on those days each month when they may not feel like reporting in?

5. Will our company labor policies attract girls and women of the type we most need?

6. Which of our supervisors will be safest with a harem of women in their departments?

7. How will an increase in women workers affect our insurance?

8. Are we going to need increased restroom facilities? How about provision for more and comfortable chairs?

9. A woman's grasp is smaller, and not as firm as man's. Will some of our working units have to be reduced in order to adapt them to this anatomical difference?

10. Women's efficiency is improved when there is provision for them either to sit or stand at their work. Can we do this, or why not?

11. Women excel in light, dexterous work. Which of our jobs require this primarily? Why not start the change-over in these departments?

12. Women excel also in the sharp use of their eyes and ears. Good idea to work them into inspection work requiring this, isn't it?

13. Vertical lifting is one of women's weak points, and not the best thing in the world for them. Can't a lot of our lifting be changed to pushing, or helped by counterpoises or electric lifts?

14. Women are more likely to become discouraged. How can supervisors guard against the ill effects of this?

15. Are we more likely to need rest pauses, or longer rest pauses, to get maximum production from women workers?

16. Having to make decisions slows women down more than it does men. Can our jobs be simplified or standardized to reduce the need for making decisions?

17. Women's joints are anatomically different, making their rotary motions (screwdriver, auto steering wheel) awkward, fatiguing, inaccurate. To which of our jobs does this apply?

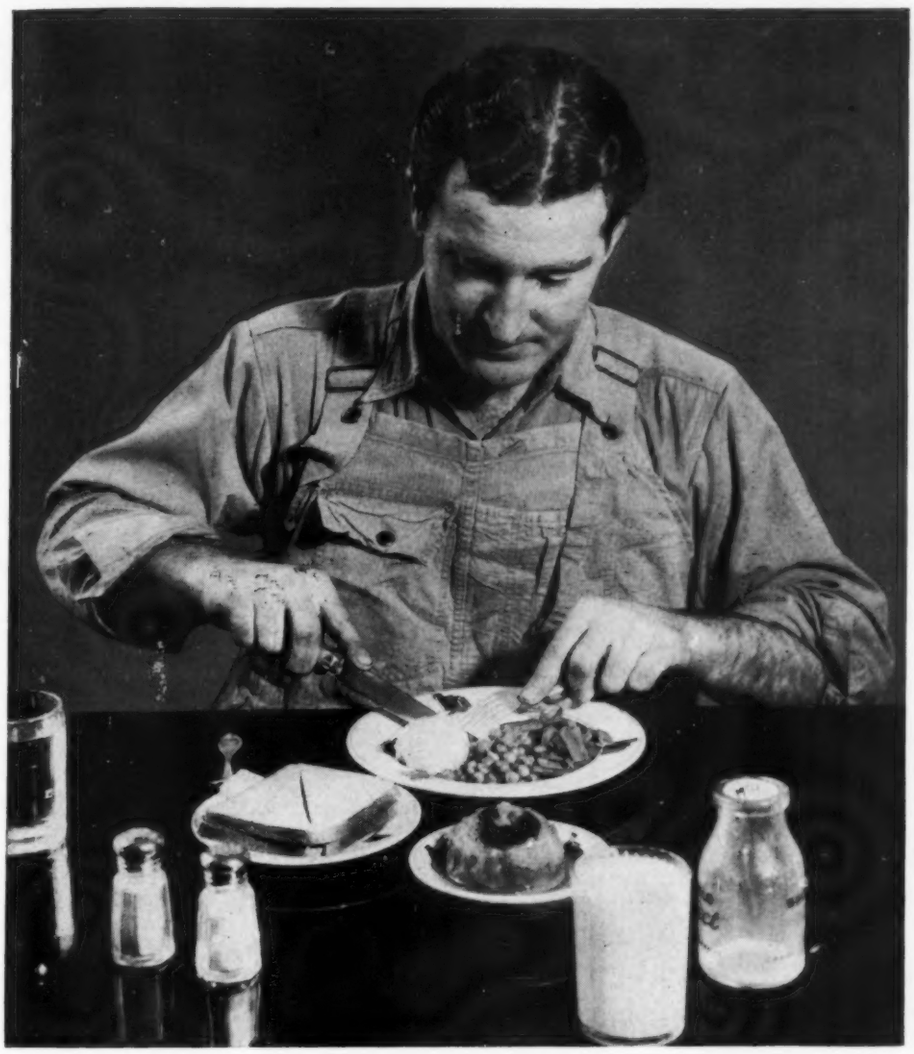
18. Women have a shorter arm

(*Continued on page 202*)

Women become hungry between meals more often than men do. Special canteen arrangements may have to be made

FACTORY MANAGEMENT AND MAINTENANCE • JANUARY, 1943

FOURTH ANNUAL SPECIAL SECTION DEVOTED TO THE SUBJECT OF HEALTH AND SAFETY FOR WORKERS IN INDUSTRIAL PLANTS



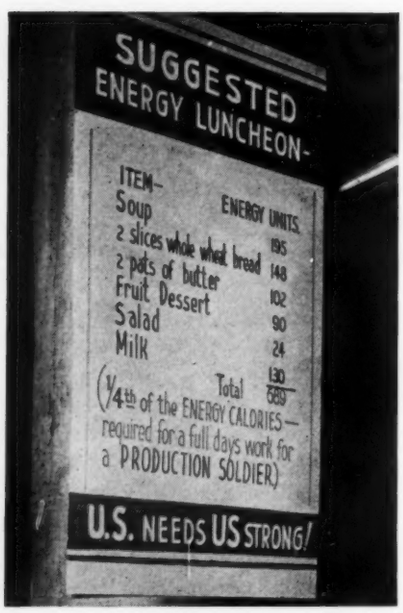
CASE STUDIES IN NUTRITION • RECREATION • MEDICAL SERVICE • ACCIDENT PREVENTION • FROM BENDIX • CARNEGIE ILLINOIS • NORTH AMERICAN AVIATION • NATIONAL CASH REGISTER • LOCKHEED • ALLIS-CHALMERS • MINNEAPOLIS-MOLINE

HEALTH AND SAFETY ☆ ☆ ☆ ☆

to make best use of manpower

Problem is to serve good food, nutritionally adequate, at reasonable prices. So Bendix turns the job over to a caterer, hires a dietitian

Promoting Nutrition to Employees



Posters make vitamins popular

FOR A SIMPLE, successful solution to the problem of feeding war workers, we recommend our plan of turning the job over to a commercial caterer and employing our own dietitian to serve in an advisory capacity.

Part of the problem, as we see it, is to serve good food at low prices. This is where the outside supplier comes in. We are radio manufacturers, not restaurateurs. How, therefore, could we hope to do better than a concern that has been operating industrial cafeterias for many years, and right now is operating them in more than 50 plants?

The rest of the problem is obviously to serve food that is nutritionally adequate. We are interested in nutrition because we know there are certain deficiencies in the diets of our employees. We know that these deficiencies make it impossible for us to expect maximum efficiency from the men and women who work in our plant. We know that a poor diet can cause absences, upset a worker's general morale, increase his chances of getting hurt, affect his vision, and influence his entire emotional and physical well-being.

We know that men and women who come to work on an empty stomach cannot be expected to turn out as much work as those who start the day with a decent breakfast. We know that many employees who seem to be slow in getting adjusted to factory conditions, or who appear to be just plain mentally lazy, are really the victims of faulty diet.

And this is where the dietitian comes into the picture. It is her job (1) to see that nutritious food is served,

By R. G. Spence, Personnel Director, Bendix Radio, Division of Bendix Aviation Corporation, Towson, Md.

Count malnutrition just as much of a saboteur as the enemy who plants a bomb in a war factory. Deficiencies in diet weaken morale, dull the desire to product

—Paul V. McNutt
Chairman, War Manpower Commission

and (2) to educate employees in the fundamentals of nutrition. She is thus the representative of the management and the employees in the cafeteria. She handles complaints, there are bound to be some. Primarily, however, she is there to educate the workers. She must quietly, unobtrusively, continually plant the thought in workers' minds that the kind of food they eat is vitally important, that only by eating food of adequate nutritional value can they hope to give their best and thus help win the war.

This education, it should here be emphasized, is mostly of an informal nature. When, for instance, someone orders a sandwich, the girl behind the counter invariably asks: "On whole wheat or rye?" Sometimes the dietitian looks over a tray and remarks: "What! no milk?" Or perhaps she murmurs: "Long on calories today, but short on vitamins." Many of these gentle barbs hit the mark, and many an employee has switched to more nutritious food as a result.

But we have found that offering the employee a well-rounded plate lunch is the best way to "sell" nutrition. Two carefully planned "specials" are therefore on the menu every day, one for 25 cents, the other for 40 cents.

On November 23, for example, the 25-cent special was baked macaroni and cheese, beets, cole slaw, bread and butter, tea or coffee, stewed fresh apples and raisins. On the same day the 40-cent lunch was sausage cakes and apple rings, two vegetables, bread and butter, choice of beverage, and a dessert. Those who did not want the specials could on that particular day take their choice of such entrees as roast lamb, chicken salad with fried oysters, and kidney stew with mushrooms.

Another way we sell the idea of the right kind of food is through the prominent display of a wide variety of salads and plenty of fruit and fruit juices. One woman in the plant wrote recently to the dietitian:

"The special today was very good—well balanced. Am pleased that you have fresh orange juice. My daughter who works here can now get her vitamins. She has been drinking pop for lunch—does not like milk." Comments like that one convince us that we are making real headway.

Not only are salads prominently displayed. There are also plenty of different kinds. In fact, our dietitian has made a specialty of them. She has taught the salad girl how to prepare her plates attractively, and she has had a special compartment in the refrigerator set aside for the storage of salads at proper tempera-

Salads are attractively and prominently displayed. Made up in advance, they are brought in from the refrigerator only as needed. Their sale has jumped ten times

Best way to "sell" nutrition is by offering a well-rounded plate lunch at an attractive price. Two carefully planned "specials" are therefore on the Bendix cafeteria menu every day, one for 25, the other for 40 cents

Two out of three drink milk! Education in nutrition is unobtrusive, unceasing

tures. Salads are now made up in anticipation of the demand, but not removed from the refrigerator to display shelves until actually needed. Salads are increasingly popular, especially with the women who now make up a large percentage of our personnel, and their sale has increased something like ten times over the past eight or ten months!

Sell More Milk

Milk is pushed in every way possible. One thing we did was discontinue the sale of soft drinks in the cafeteria. They can still be obtained from the vending machines out in the plant, but we have in this way discouraged their consumption at mealtimes. In six months we have been able to increase the sale of milk by close to 25 percent.

One little sales device used with excellent effect by our dietitian is what we call a "did you know?" at the bottom of the daily menu. Menus are prepared and distributed to department heads in plenty of time for posting on bulletin boards. Employees thus know what is on the bill before they go to the cafeteria. This serves a double purpose. It helps them make up their minds in advance and thus speeds the serving line when the big rush is on. Also, it gives workers plenty of time to read the daily tip. For instance, one "did you know?" ran like this:

"Did you know that sweet potatoes contain more calcium, phosphorous, vitamin B_1, vitamin C, and riboflavin than white potatoes? And more than 100 times more vitamin A than white potatoes? One medium-sized candied sweet potato contains approximately 307 calories (reducers take note) as compared to 130 in a medium-sized white potato."

These informative little squibs cause a lot of comment. Only the other day a husky maintenance worker said: "If we get riboflavin and all those vitamins in a baked apple, I guess I can't afford to pass them up for a dime." This is only one of dozens of comments that proves to us that the "did you know?" is carefully read.

Posters also have been most effective. We recently had one extolling the virtues of whole wheat bread. Sales of that item doubled almost overnight, and have continued to run far ahead of what they used to. Even today, months after the poster was used, we occasionally have a man walk up and order "a slab of ham between two slices of B_1."

Education in nutrition does not end in the plant. Booklets have been distributed with a view to carrying the good word into the home. One folder, for example, shows the five "foods we should eat," and the amounts that should be eaten. It also contains a pattern menu that can be used as a guide in planning meals. This literature, we find, is at least taken home. There is no way, short of an elaborate survey, for us to tell how widely it is being used there. On the other hand we do know that our efforts within the plant are being crowned with success. We have always tried to serve meals that are attractive in appearance, nutritionally adequate, and can be sold at the lowest possible price. That we are succeeding is proved, first, by a recent survey made under the auspices of the University of Maryland; after a visit to our plant, a member of the county nutrition committee wrote us this letter:

"In comparing the eating habits of employees of several outstanding industrial plants in Baltimore County, I observed that a much larger percent of workers at the Bendix Plant selected well-balanced meals, including fresh fruits, vegetables, whole grain bread, milk, and milk products. It was the only plant where no soft drinks were served in the cafeteria."

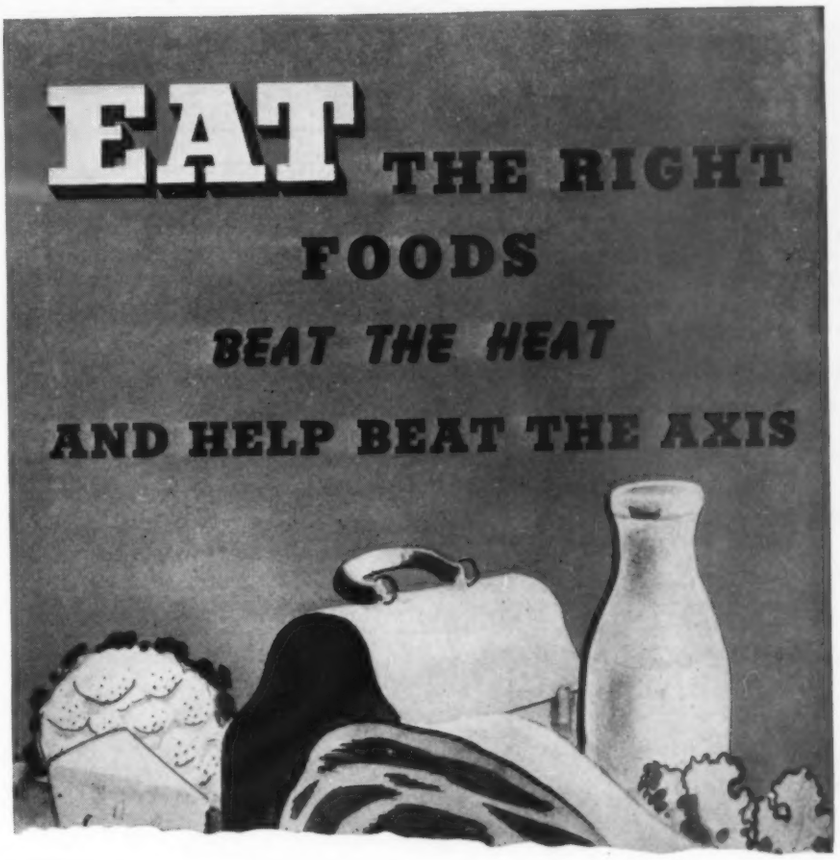
Beyond that, we have only to "look at the record." It shows ever-increasing sales of the kind of food that war workers ought to eat.

Teaching Wives to Plan Meals

BETTER NUTRITION for war workers, through a "Health for Victory Club," is the objective of a successful series of meetings now being staged for homemakers in the vast South Chicago industrial region. The program is being sponsored by the Good Fellow Club of South Works of Carnegie-Illinois Steel Corporation.

Already more than 1000 women—members of the first Health for Victory Club in the Chicago area—are studying wartime problems of food purchasing and preparation under the guidance of trained home economists from a nationally known utility. Five hundred of these homemakers were first enrolled in the club four months ago, and an additional 600 attended recent sessions on nutrition. A twice-a-month meeting schedule was inaugurated in October in order to reach all nationalities.

First recommended by G. P. Ward-



Right, booklet lists precautions that lick the heat, and contains hot-weather menus. Below, pages from meal-planning guide

HEALTH-BUILDING MENUS FOR EVERY DAY I

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY
BREAKFAST	13 Orange Juice Waffles—Syrup for Pancakes and Waffles Bacon Coffee—Milk	14 Tomato Juice Hot Cereal with Whole Milk Fried Hominy Grits—Bacon Coffee—Milk	15 Baked Apple Hoosier Scrapple Buttered Toasted Graham Muffins Coffee—Milk	16 Stewed Prunes Buckwheat Cakes Syrup for Pancakes and Waffles Coffee—Milk	Applesauce Fried Corn Meal Mus Molasses Butter Syrup Coffee—Milk
LUNCH	Bacon-Cheese Sandwich on Enriched White Bread Cabbage-Carrot Salad Applesauce Cake Milk	Lima Bean Soup Toasted Rolls—Jelly Lettuce Salad with Sour Cream Dressing Chocolate Cake Milk	Hot Corn Meal Mush with Whole Milk Grapefruit and Carrot Salad Apple Milk	Beef-Tomato Sandwiches on Whole Wheat Bread Apple Eggnog—Tea	Dutch Beans Toasted Yellow Corn Meal Bread Canned Fruit Tea—Milk
DINNER	Meat Loaf Scalloped Potatoes Baked Squash Lemon Sunshine Salad Refrigerator Rolls—Butter Canned Fruit Chocolate Cake Coffee—Milk	Beef and Rice Casserole Mashed Rutabagas Graham Muffins Kidney Bean Salad Apple Brown Betty Tea—Milk	Scalloped Ham and Potatoes Sour Milk Biscuit Creamed Carrots Gelatin Fruit Salad Lemon Cream Rice Pudding Coffee—Milk	Hot Potato Salad and Frankfurters Creamed Onions Corn Bread Apple Tapioca with Cream Tea—Milk	Vegetable Loaf with Brown Sauce Sour Cream Cabbage Carrot and Raisin Salad Prune Muffins Apple Oatmeal Crumble Coffee—Milk
LUNCH BOX	Canned Soup—Crackers Peas and Dried Beef Sandwich Filling on Enriched White Bread Combination Salad Sandwich on Enriched White Bread Deep Dish Plum Pie	Meat Loaf Sandwich on Enriched White Bread Peanut Butter Sandwich on Enriched White Bread Grated Carrot Salad Canned Fruit Chocolate Cake Coffee	Lima Bean Soup—Crackers Rye Bread and Cheese Sandwich Sandwich of Homemade Enriched White Bread and Jelly Kidney Bean Salad Apple—Candy Bar	Creamed Leftover Vegetable Soup Whole Wheat Bread with Ground Ham Spread Rye Bread with Bacon-Cheese Sandwich Spread Grapefruit and Carrot Salad Lemon Cream Rice Pudding	Mock Chicken Sandwich on Whole Wheat Bread Beef-Tomato Sandwich on Whole Wheat Bread Apple Tapioca and Cream Coffee

You should eat these foods every day
MILK AND MILK PRODUCTS
MILK
MILK
At least a pint for every adult. 3/4 to 1 quart for every child. 1 to 1 1/2 quarts for the expectant or nursing mother. Use milk to drink and in cooking. Skim milk, buttermilk, evaporated milk, dried milk, or cheese may be substituted or whole milk
BREAD AND CEREAL
CEREAL
FLOUR
. . . whole grain or enriched white bread and flour, whole grain or cereals restored to whole grain value
MEAT, POULTRY, FISH
MEAT
. . . use liver, kidney, heart for especially good value
ORANGES, TOMATOES, GRAPEFRUIT
FRUITS
VEGETABLE
. . . fresh or canned, or raw cabbage or salad greens — at least one of these
DRIED BEANS, PEAS, NUTS, PEANUT BUTTER
PEAS
BEANS
PEANUT BUTTER
NUTS
. . . these are good foods, use often
GREEN OR YELLOW VEGETABLES
SOUP
. . . one big helping or more — some raw, some cooked
EGGS
FRESH
. . . at least 3 or 4 a week, cooked any way you choose — or in "made" dishes
OTHER VEGETABLES AND FRUITS
FRUIT
FROZEN FOOD
. . . potatoes, other vegetables, and fruits — fresh, frozen, canned, dried
BUTTER AND OTHER SPREADS
SPREADS
. . . butter, vitamin-rich fats, and similar spreads in moderation
HEN EAT OTHER FOODS YOU ALSO LIKE

Typical exhibit from one of the meal-planning guides which are being distributed free to wives of Carnegie-Illinois workers

ley, assistant vice-president, Industrial Relations, Carnegie-Illinois Steel Corporation, the Health for Victory Club plan as outlined by representatives of a Mansfield, Ohio, utility and carrying the full endorsement of the South Works war production drive committee, was adopted by the board of directors of the Good Fellow Club in July.

Launching of the Health for Victory Club required about two months of preliminary planning, during which invitations were printed in quantities sufficient for distribution to all employees and families living in the immediate vicinity of the industrial plant. South Works foremen assumed the responsibility for circulating the invitations through their various departments. Patriotic posters announcing the club's first meeting were given prominent positions on large bulletin boards at all entrances to the plant and on small boards within the plant.

Publicity, with appropriate photographs, is released to daily and weekly newspapers before each regular meeting of the club. For September additional advertising was obtained through the medium of a movie "trailer," and war bonds and stamps were used for door prizes. Actual cooking demonstrations are given by home economists, and copies of meal-planning guides, prepared a month in advance and containing menus based on a minimum food budget for a family of five on $14 a week, are distributed free to all homemakers.

The guides, which are issued every other month, contain health-building menus for every meal in the month, about 60 pages of menus, and such special features as (in December) Christmas in the Army, cooking to retain vitamins, general rules for cooking vegetables, and meat cuts and how to cook them.

Five temporary committees, in addition to another committee comprised of wives of board members and wives of relief committee members, were appointed for the September meeting. Permanent committees have since been selected to handle all activities of the club throughout the year. Each has two co-chairmen, representing labor and management, and, of the 25 or 30 members on each, half are from labor and the other half from management. These committees are: Executive, publicity, general arrangements, menu-recipe booklet, registration, invitation, and music.

For Office People, Too

The club's highly successful opening program in the South Chicago Masonic Temple on September 22 was conducted by Mrs. Julia Kiene, director of the Westinghouse Home Economics Institute and originator of the idea. Principal speakers were Mrs. M. J. Devaney, executive chairman, and B. M. Livezey, general superintendent of South Works.

The idea was then picked up by the Two-O-Eight Steel Club composed of the Chicago office employees of Carnegie-Illinois, and monthly meetings were arranged in Chicago's Loop. Invited to attend these meetings are women employees of all United States Steel subsidiary company offices at 208 South LaSalle Street, and wives of men employed in these offices. The second meeting was attended by about 200.

More than 300 industrial plants through the United States now have adopted the Health for Victory Club plan, which carries the approval of WPB Chief Donald M. Nelson and M. L. Wilson of the Federal Security Administration. It has received much favorable comment from Paul V. McNutt, chairman of WMC.

Keeping Plant People Fit

KEEPING PHYSICALLY FIT is an obligation that war workers must meet. Our most valuable war equipment is not only the planes, tanks, guns, and ships that move to our far-flung battle fronts, but also the men and women who build and operate them.

A physically unfit employee cannot keep pace with the heavy production schedule which the nation is now maintaining.

For this reason, North American believes that recreation has a vital part to play in the war production program. Industrial workers need recreation during their leisure hours to be effective on their jobs. Recreational activities afford the balance wheel to the high tension of industrial activity.

Three Kinds of Recreation

North American emphasizes three major divisions in its recreational program: (1) Social, (2) cultural, and (3) physical activities. In some plants the popularity of a single division overshadows the interest in the other divisions. In our opinion, however, a well-balanced program should stress participation in all three groups.

Group leaders play an important part in the success of the recreation program. If capable and enthusiastic leaders are secured to head the activities, much has been accomplished toward their successful promotion. We stress this matter at North American.

Interest in the recreation program is also spurred by the news stories and photographs of various activities which appear frequently in the two plant publications, *Skyline*, a bimonthly magazine, and *Skywriter*, the weekly newspaper published at the Inglewood plant for employees.

The recreational program at North American is perhaps best illustrated by the following breakdown:

Social—banquets, dances, smokers, theater parties, picnics.

Cultural—art clubs, camera club, lectures, music, dramatics.

Physical—baseball, basketball, bowling, boxing, fencing, golf, horseback riding, rifle and pistol clubs, roller and ice skating, skiing, softball, swimming, tennis, track, weight lifting, wrestling.

Since the entry of the United States into the war, a number of groups have been formed in which employees are enrolled who desire to add a little extra to the war effort by devoting some of their leisure time to projects related to the welfare of our armed and civilian defense forces.

One of the principal organizations is the North American Red Cross

By KENNETH L. KELLOUGH, Director of Recreation, North American Aviation, Inc., Inglewood, Calif.

Members of swimming club at North American meet frequently after their shift is over and go for a dip in the nearby Pacific

Favored sports naturally include both baseball and softball. Last season 80 teams in 10 leagues played an 18-game softball schedule. The North American baseball team won the Southern California Traveling Summer League Championship after an exciting series

America needs men and women capable of doing more than they have ever done before. Only by providing recreation — re-creation of strength and spirits after toil — can industry be assured of getting that kind of manpower

—Charles P. Taft
Director, Office of Defense Health and Welfare Services

At North American, as in so many other plants, bowling tops all sports in number of participants; 140 teams are now playing in weekly handicap games. There are several women's leagues

Lunch-hour entertainment has proved extremely popular. Regular variety shows are sponsored by the recreation department. The photograph below was taken during a boxing bout

First Aid Unit, composed of 250 women who have completed both the standard and advanced first aid courses. They are organized into squads which stand ready day or night to assist our plant medical department in case of an emergency demand for first aid treatment. These girls also collect sweaters, socks, reading material, and recreational equipment, which they send to men in the armed forces overseas. For example, the girls recently sent more than 100,000 packages of cigarettes to men in service abroad.

USO Benefits

North American women are active in USO affairs, and 500 women recently attended a dance given for the benefit of service men located near the plant. One of the latest service clubs to be organized is the Navy Wives, who meet regularly and make supplies for Navy hospitals.

The following is a brief account of athletic activities either now in progress or sponsored last season by the recreation office:

Softball—last season ten leagues comprising 80 teams played an 18-game softball schedule. Play was on an interdepartmental basis with teams playing one league game each week. However, many teams played as many as 35 games during the 5-month period. Day and night championship teams were determined, and finally these two teams played for the plant championship.

Baseball—after an exciting series of games last season, our team won the Southern California Traveling Summer League Championship.

Basketball—seven leagues of eight teams each are now participating in interdepartmental basketball. Champions will be entered in the City Industrial Championship tournament which is sponsored by a leading Los Angeles newspaper.

Bowling—one hundred and forty teams are now playing in weekly handicap games.

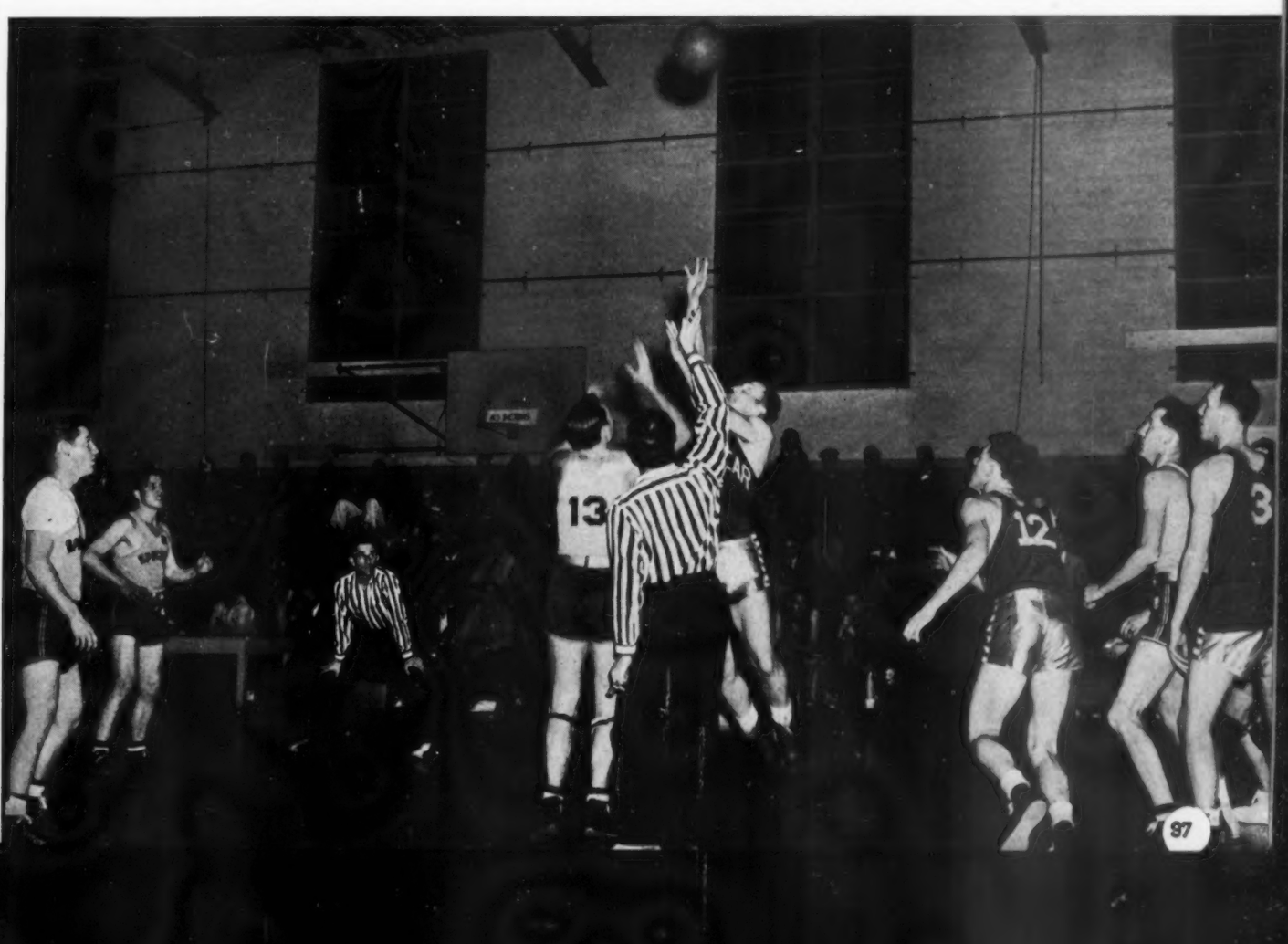
Golf—handicaps have been established for over 200 golfers who participate in plant tournaments.

Track—recently North American sponsored a series of weekly invitational track meets which were open to all industrial teams. During these meets a North American employee, Emerson L. McKenzie, established a new unofficial world's record for the javelin throw, when he threw the spear for a distance of 264 feet, 6 inches. North American's track team competed in eleven meets, never placed lower than third, and finished the season by winning the Los Angeles Industrial Track Championship.

Social and cultural affairs—the recreation department is constantly planning and encouraging parties and departmental picnics. Recently the plant was fortunate enough to engage May Lilian Fox, noted writer and lecturer on cultural affairs, to conduct a series of lectures on "Streamlining Personality." These lectures have proved popular with both men and women. Regular variety shows are sponsored in a newly erected recreation area during lunch periods. Entertainment for these programs includes acts selected from talented employees and two plant bands, together with special features from the outside. Hoagy Carmichael, Allan Jones, Arleene Harris, and Paul Robeson are some of the guest stars who have made recent appearances on lunch-hour programs.

Results? Obviously, it is impossible to measure them. But North American knows that its people need recreation and believes that providing the facilities for recreation and making it available to every employee is one of its prime responsibilities.

Basketball brings out the crowds. There is a team for almost every department in the plant



Providing Worker Recreation

EVERY EMPLOYEE at NCR these days has his mind on war production. Everyone is working harder. Many are working longer hours. Many are on night shifts or other off-hour shifts. Each one, no matter what his job, is turning out more production per minute, per hour, per day.

Naturally, a manufacturing organization must depend for sustained volume and quality production on its working personnel, and unless that personnel is kept fit mentally, morally, and physically, the exacting needs of wartime operation cannot be met.

Greater than ever, therefore, is the company's belief in its own responsibility for maintaining the physical and mental fitness needed to continue this pace. There is no administrational division of NCR more occupied these days than industrial relations. And of the NCR industrial relations activities that make this group of workers outstanding wartime producers, recreation may be listed as *number one*. It is the NCR belief that more work and less play would make Jack a dull worker were it not for facilities for respite and recreation conveniently and freely supplied for every worker, man or woman.

By JOHN E. ERNST, Recreational Director, National Cash Register Company, Dayton.

In the summer there is the tremendously large and effective NCR "Old River," a combination of recreation field, swimming pool, boating lagoon, picnic grove, ball park, and tennis courts, amounting to about 180 acres of territory within a stone's throw of the factory itself.

Here at Old River, NCR most closely identifies the worker's family with his employer. It is here that the wives, mothers, and children of employees spend their days while the father works over at the factory, to join them when the whistle blows, for a picnic supper and an evening of recreation or rest. It is here that the NCR gateman has clocked as many as 7500 admissions on a Saturday afternoon or a Sunday. Last year's figures show that approximately 145,000 persons entered the park.

In winter? First it must be said that bowling is one of the major winter sports at NCR. Not only do NCR workers follow the sport in their neighborhood bowling alleys, but more than 1000 of them are in organized leagues, a company-sponsored project. The best of them have their inning each year at the American Bowling Congress.

Up the road a block or two from the factory the tremendously large coliseum of the Montgomery County Fair Grounds is leased each year by NCR strictly for employees' activities —basketball games by nearly 30 departmental teams, table tennis, bait casting, badminton, volleyball, shuffleboard, and indoor archery.

Nor is all the activity in this coliseum of athletic type. Each month an NCR family party is held with a floor show and dancing.

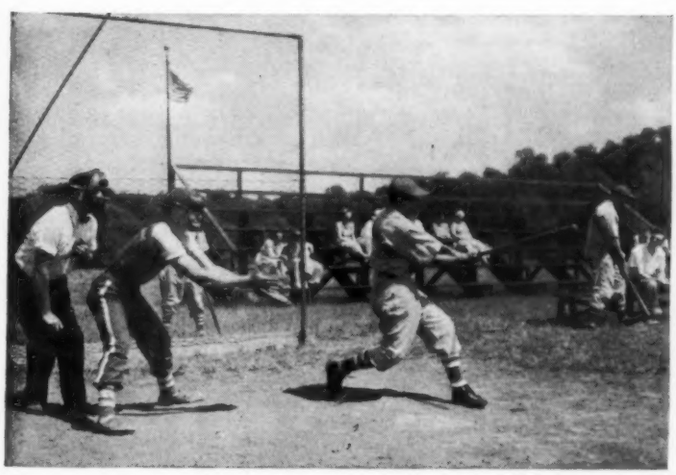
The spirit of good fellowship and of play is fostered within the factory as well. For many years the noon hour has provided many employees with the opportunity and facility to play ping pong, checkers, and dartball within their own departments.

Perhaps because Dayton is so trapshooting-minded (being headquarters

There are movies and special mealtime entertainment for those who like to take their recreation sitting

EMPLOYEE RECREATION

NCR people swim in one of the biggest industrial pools in the country. It's floodlighted for night use



Softball and baseball are favorites. Volleyball is one of many pastimes enjoyed in Old River's 180

acres. There is a driving range for the many golf addicts, and canoeing for the young people

Reading, lest one forgets, is one of the best types of true recreation. NCR library contains approximately 8500 books as well as current magazines and newspapers, all available to employees

of the National Association), many employees like target practice and skeet. A rifle target practice club is also maintained for employees. Practice is done in an indoor range. Col. E. A. Deeds, chairman of the NCR Board, often invites NCR employees to participate in skeet and trapshooting at his private gun club, and, when possible, joins them in this sport.

Sitdown Recreation

For those who are a little more passive in their recreational tastes, entertainment is not overlooked. Each noon throughout the week, in the auditorium seating 2600 employees, men and women enjoy the finest motion picture features, shorts, comedies, etc. Occasionally special entertainment is provided. For instance, not long ago the Cleveland Symphony Orchestra presented a program in the auditorium during the noon hour.

For those whose taste runs to reading and studying, there is the NCR library. In addition to current magazines and newspapers, this library contains approximately 8500 books, some of them fiction, but in the main technical books, which have helped many employees in their work. This material is released on much the same basis as in a public library, and may be read either in the home or in the large, comfortably equipped reading room. Reference material also is at hand, and many questions are answered by the librarians in charge, who will obtain additional information from outside libraries for those who require it.

Night school is a form of "recreation" enjoyed by thousands of employees who have thereby stepped up their progress and added to their general education. In the modern NCR school building a total of 23 subjects are being taught in the current session. The curriculum includes vocational and mechanical subjects, many of them taught by NCR men, who work during the day on a job similar to the subject being taught, thus making their teaching practical. The faculty also includes many professional teachers who have been hired from the Dayton community.

Every consideration is given to the comfort, convenience, and contentment of employees while at the factory. For instance, an employee may enter the plant in the morning and need not leave until he stops work in the evening, if he prefers, as all 27 buildings, with one or two exceptions, are connected by underground tunnels or overhead bridges.

Fits Today's Needs

Thus it is today that NCR is the proud possessor of several symbols of Government and War Department tribute in war production as a result of the fitness, ability, and diligence of its 10,000 men and women employees. Not that there is anything radically different in the NCR employee relations program in wartime. Rather, the same basic principles governing NCR employee morale and fitness through the years have been expanded and further crystallized to meet the unusual need today. The long, successful application of the NCR industrial relations formula is probably bearing its most impressive fruit in the decades since its inception.

Combating Health Hazards

All the top-notch machine tools in the world for making guns, tanks, ships, and planes are useless unless we have healthy workers to operate them—without interruption

—Dr. Victor G. Heiser
Medical Consultant, National Association of Manufacturers

ANY NEW OR EXPANDING INDUSTRY is certain to develop new hazards and encounter new medical problems. Lockheed is no exception to the rule. The practice of industrial medicine, however, is fundamentally the same in all industries and consists of three basic principles: (1) Efficient treatment of industrial injuries and diseases; (2) prevention of these occupational injuries and diseases; and (3) maintenance of the general health of the workers.

At Lockheed we "look at all three," and try to give each the attention it rates.

Treatment of Injuries

The aircraft industry is peculiar in that nearly all the work is light and free from serious hazard. Most of it, in fact, is hand work involving the use of small tools, drills, etc., and the manual handling of sharp-edged sheet metal. The inevitable result is a large number of finger and hand injuries.

This situation presents two important problems: (1) Adequate treatment of all these minor injuries; (2) treating the injuries as quickly as possible with the least amount of time lost from work.

The necessity for treatment of *all* minor injuries is obvious when we consider the hazard of infection that is always present and the possibility of converting an apparently insignificant injury into a complicated major one. Our infection rate at Lockheed is at a virtual minimum, less than 1/10 of 1 percent.

Treatment for minor injuries can be enforced only if such treatment is easy of access, because if difficulty is encountered in leaving a job to go to a first aid station for treatment, either because of reluctance on the part of the foreman to allow employees to go, or on employees' part because of the distance to travel, the employee may decide to take a chance and ignore the injury. In this connection it is also important to note that we do not subject the person with an injury to ridicule or censure or an acid lecture on carelessness while he is being treated. This may make him ashamed or afraid to come back for treatment. Rather is he treated as one of sound intelligence for having come in for treatment of his minor injury.

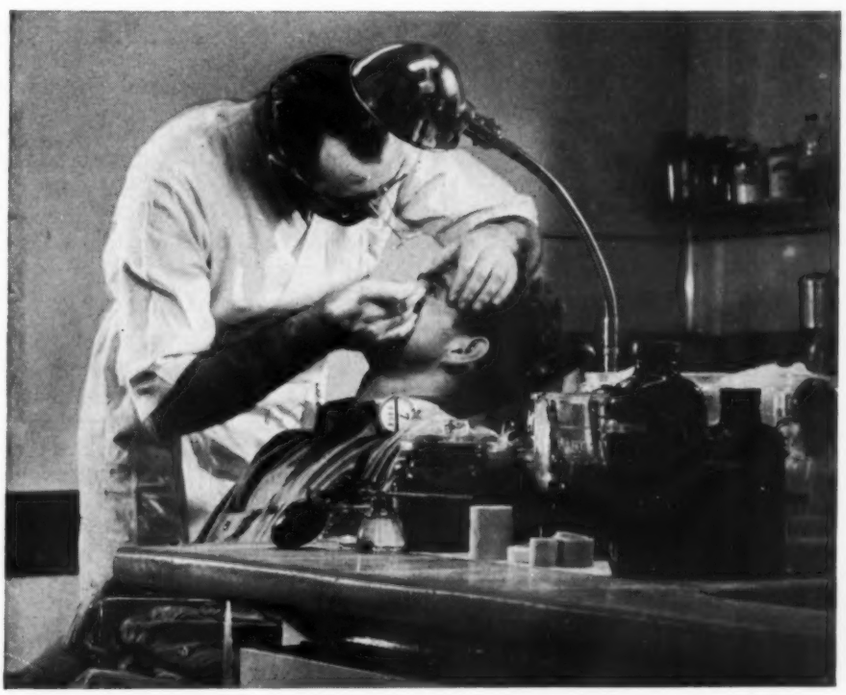
We recognize that a certain number of minor injuries to hands and fingers are inevitable. I do not mean in any way to minimize the importance of safety campaigns, but do believe that tact must be used in the first aid stations to avoid the creation of resentment or fear on the part of the employee that his injury may reflect to his discredit and thereby lead him to conceal or neglect it. On the contrary, self-treatment or neglect to report a minor injury is considered more serious than reporting *frequently* for treatments.

Ease of access to the first aid stations is necessary, then, to assure a maximum number of minor injuries being cared for, and to reduce the time lost in receiving treatments. The time factor becomes of major importance in a plant as big as ours where there are several thousand visits per week to the first aid stations. Our policy of setting up a number of first aid stations throughout the plant is thus seen to be sound.

Small puncture wounds of the extremities form a fair percentage of our injuries because of the fact that high-speed drills are used in large numbers. Wounds are debrided thoroughly, and a particular attempt is made to remove all metal particles. This is particularly important because of the irritation that may result from the presence of aluminum or magnesium particles.

The practice of giving tetanus anti-

By F. E. POOLE, Medical Director, Lockheed-Vega Aircraft Corporation, Burbank, Calif.



Self-treatment or neglecting to report a minor injury is considered more serious at Lockheed than reporting frequently for treatment. Here, early and gentle first aid for "something in my eye"

toxin to everyone who has a minor puncture wound is one that is open to debate. After having had numerous serious reactions with serum sickness and neuritis, one hesitates to give tetanus antitoxin promiscuously. However, we *do* use it in a majority of wounds, but anticipate that with the introduction of vaccination against tetanus this problem will be limited.

Occupational dermatitis is one of our principal hazards. It is most frequently caused by contact with aluminum alloys, zinc chromate paint, and solvents. Cases are diagnosed by patch tests and are fairly easily limited by transferring the individual to some type of work where he avoids contact with the substances that cause the irritation.

Eye injuries are quite common in spite of the fact that ample use is made of protective devices and goggles are mandatory on certain jobs. These injuries, however, all fall in the classification of minor conjunctival or corneal abrasions or foreign bodies, and consequently the initial first aid treatment is of great importance in the prevention of corneal ulcers. We have no new methods of treatment; early and gentle treatment is probably the most important factor.

Prevention of Disease

Supplementing the work of the safety engineer in the prevention of accidents is the work of the industrial hygienist and toxicologist in the prevention of occupational disease. Lockheed puts much emphasis on this phase of the worker health program.

From the toxicologic standpoint our most important hazards are vapors from chemical baths, degreasing solutions, paints, and paint thinners. These consist of trichlorethylene, xylene, tuolene, carbon tetrachloride, etc. Although there have been only isolated instances where occupational diseases could be traced to these sources, nevertheless the hazard with changing manufacturing conditions is such that it is imperative that more or less continual sampling operations be carried on to determine whether the vapor concentrations are kept within the specified non-toxic levels.

It is important, we have found, to check the potential sources of hazard at regular intervals and under varying working conditions of day and night so that a definite record may be maintained of such hazards for future reference, if necessary, in the investigation of claims, and as an index to guide us in instituting specialized examination procedures to determine early signs of intoxication.

The industrial hygienist's problem is one that gets little publicity or little credit, but as a control measure in the prevention of disease it is probably one of the most important aspects of the safety program.

Maintenance of Health

The health of the individual worker determines the number of man-hours that he can contribute. Each day lost through sickness represents the loss of eight hours of potential productive effort and a loss to the employer of the cost of his replacement with another worker. The average loss of time from work due to non-occupational illness alone averages eight days per year for every male and twelve days for every female worker, or a minimum loss of 64,000 man-hours for every thousand employees. Any portion of this that can be saved by a health maintenance program is a direct contribution to our war production effort.

Maintenance of health at Lockheed begins with the employee's entrance examination, which is given with the view of placing a worker in a job safe to himself and his fellow-workers where his abilities may be used to best advantage. His primary placement examination allows industry to take the fullest advantage of a worker's ability and to assure the worker himself that he is being placed on a job commensurate with his physical ability and among a group of employees who are reasonably healthy and free from communicable disease. All the modern techniques of examination are used, including urinalysis, Wassermann, and chest X-ray tests.

Such pre-employment examinations are of much greater importance now than they were prior to the war because the labor supply now must be taken primarily from the group not eligible for military service. We have therefore conducted surveys to determine the types of jobs available for physically handicapped individuals. If in the opinion of the medical examiner the physical condition of an applicant does not warrant being placed on the job for which he is

The hygienist supplements the work of the safety engineer. The latter prevents accidents; the former, occupational diseases. Here, a Lockheed researcher takes a sample in the final paint hangar

being considered, an attempt is then made to reclassify him for some type of work where his physical disability will not be a handicap to him.

Employment of Women — Women are being employed in increasing numbers, and it is equally important to see that their job placement is commensurate with their physical abilities. Industrial hazards are no greater for women than for men, but there are medical problems that require the intelligent consultation and advice of a female nurse. It has been our experience so far that the women wish to be considered on the same basis as the men, ask no additional favors, and do not further complicate the problem of maintaining health.

Return from Absence—Physical examination or inspection of an employee returning to work after absence due to illness is important in order to be certain the person is fully recovered and able to do his work. Attempts are always made to place such an individual on light work, if by doing so he can be returned to work earlier than otherwise.

Reduction of Absenteeism—From purely the financial viewpoint the reduction of absenteeism is important, especially when one considers that a plant has to carry a 2 to 3 percent overload on its payroll to provide workmen to fill the jobs of the 3 to 4 percent constantly absent through non-occupational accidents and illness. Add the cost of the relatively inefficient work done by the replacement worker and by the worker himself before and after his illness, as well as the sick-leave benefits usually paid, and you can see that the estimate made by the St. Joseph Lead Company of $70 annual per capita cost for absenteeism cannot be far wrong. An estimate prepared last year on the basis of 2 percent absenteeism revealed an approximate cost of $2,500,000 per year for this company!

This problem can be approached intelligently only by a sound statistical background to diagnose and analyze causes. We have begun at Lockheed to keep the necessary records, but our information is still too meager to discuss the practical values of such measures as vitamin supplements and oral respiratory vaccine.

Periodic Examinations—A great amount of time and effort is spent in maintaining machines. It is equally important to maintain individuals whose loss would be as significant as the loss of a piece of machinery. Our examination program starts with the executive, foreman, and supervisory group, working on down through other classifications. It includes specialized examinations for such groups as spray painters and lead workers.

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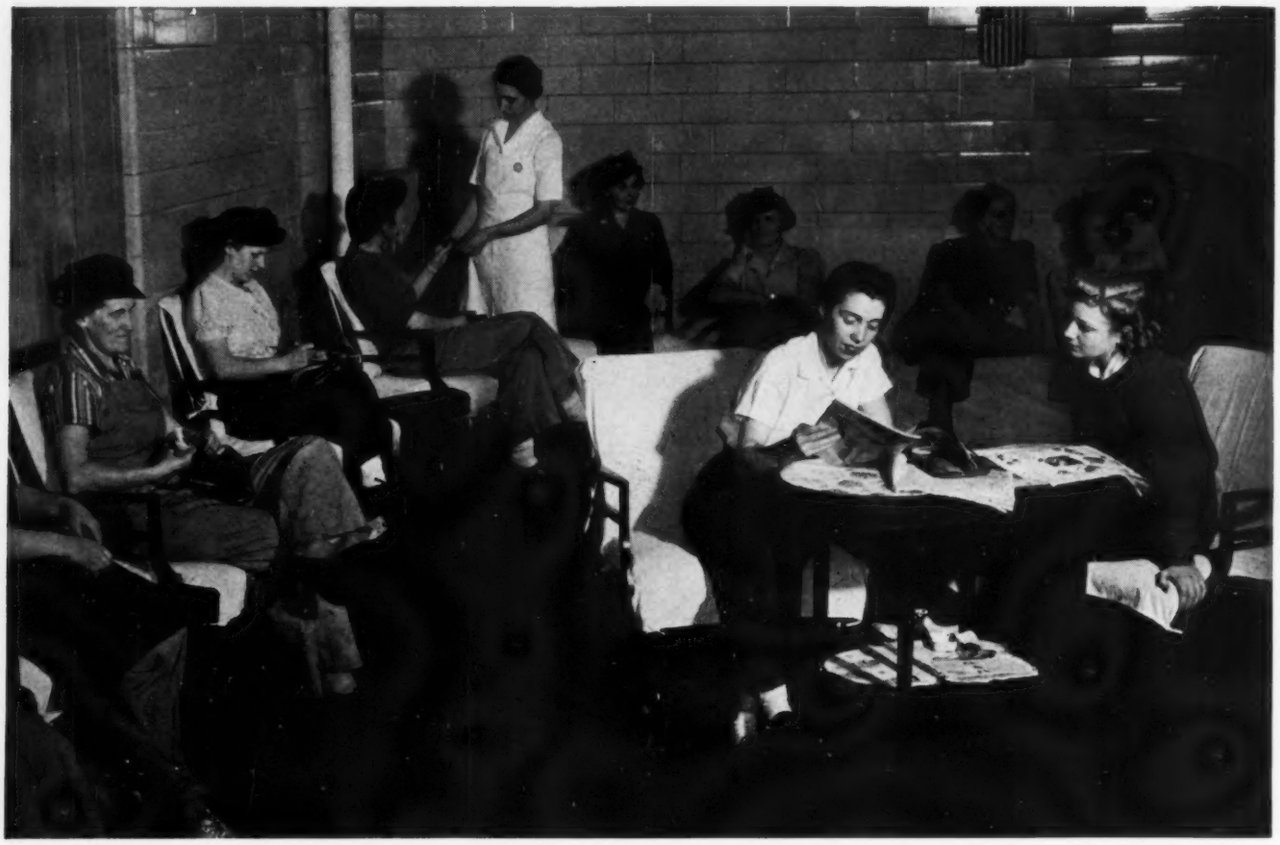
The program is not only of direct benefit to the employee, to the company, and to production, but also to the individual's family physican and the medical practice of the community in general, because it makes the employee health-conscious. Also, when early signs of disease are present, he is immediately referred to his family physician for advice and treatment.

We feel that it is important to foster and maintain this patient-physician relationship and believe this can best be done by cooperating with the employee's physician and acting as a diagnostic or case-finding agency. Actual responsibility for the maintenance of employee's health, then, is placed directly on the practicing physicians and gives each of them a greater responsibility in the health maintenance program than that of the industrial physician himself.

Research and Education—The importance of health education is well recognized. Excellent opportunities are at hand in companies that maintain weekly or monthly publications. We have attempted to have articles of general interest in these publications periodically. For instance, a recent series was run on the subject of "Vitamins and Health."

In an attempt to get some sort of answer as to what should be done from this standpoint, a nutrition survey is being conducted. Thorough examinations have been done on 1290 individuals who are being given vitamin supplements and studied from a standpoint of health and working ability. At present it is too early to draw conclusions from the survey, but we feel that only in this manner can we get scientific answers to what may seem to be everyday problems.

Making Women Like Their Jobs



Matrons in Allis-Chalmers restrooms maintain order, squelch gossip, give timely advice

BEGUN AS AN ALTRUISTIC PROJECT to protect the health of women workers on the job, the matron service at Allis-Chalmers has paid off big dividends as sheer good business. Fewer man-hours are wasted, less compensation is paid for accidents due to fatigue, and there is little or no dissatisfaction with conditions. In addition, there is always the intangible advantage of increased production, which inevitably results when workers are happy.

The department is in charge of Miss Esther Behnken, who also heads up the company hospital and nursing staff. Officially her concern is for the health of employees. Actually she is busy at everything from human relations and first aid to advising girls about their clothes and buying the furniture with which the restrooms are equipped. She remembers the days when first aid stations were a rarity and matrons in women's restrooms were unheard of. In fact, it was her sister, Mrs. Rose Hauge, who pioneered the matron service at Allis-Chalmers back in 1915, at the time of the first World War.

Mature, intelligent women were selected at that time to take charge of the new army of women factory workers, to make them feel at home in the alien surroundings to which necessity and the urge of patriotism combined had brought them.

By W. C. VAN CLEAF, Assistant Vice-President, Industrial Relations Department, Allis-Chalmers Manufacturing Company, Milwaukee.

Duties of a Matron

Today the vital need for the matron service has increased, and the staff of matrons has grown from 9 in October, 1941, to 36 at the moment, with more being added as needed.

A matron's first duty is to maintain order so that rest periods may be spent in relaxation and quiet. She makes sure that ventilation carries away the cigarette smoke. She finds out whether the girl who is lying down is a case for the hospital or is just tired. She must have a sentry's vigilance about all matters pertaining to the health of her girls. She takes pride in making the quarters to which she has been assigned as cheerful and as inviting as possible.

There are many times when a matron can give valuable advice and assistance. The girls air many personal matters in the strictly feminine sanctuary of the restroom.

Suppose Sally, a milling machine operator, stamps angrily into the lounge for her rest period.

"Jane has it in for me," she may tell the matron. "Just because she went to college and I never finished high school, she thinks she knows everything. There wasn't anything wrong with those eight pieces she rejected on me."

Sally would be too shop-wise to say that to her foreman, but she can get it off her chest to the matron.

Most likely all Sally needs is a little build-up. But if there is any possible truth in what she says, the matron

Night-shift workers from the tractor shop enjoy a snack with the matron in charge of their restroom

Matrons are on hand to preside at the coffee urn or serve milk to women workers during the afternoon rest period

consults Miss Behnken who refers the matter to industrial relations, and it is settled tactfully.

Frequently there are matters of precedent which blossom into small controversies. The older girls sometimes take their places for granted. They resent the usurping of such time-honored customs as placing a lunch on the table and thereby claiming the seat nearest it. Or the equally serious business of placing a coat in an unassigned locker and then claiming it for one's own. Regardless of how petty such arguments may seem, it is the matron's job to make a prompt and fair adjustment.

Rumors are simple to deal with. A few well-chosen words, advice not to talk about such things until proof is obtained, or a correction covering the point is usually enough.

Gossip is another matter. Simply hushing it in the restroom is no guarantee that it will go no farther and eventually cause trouble for the person involved and actual loss of efficiency due to worry. The matron may therefore bring together the gossipers and the person involved, and through a showdown effect a real understanding. Or she may disprove the gossip. Or she may speak to the person involved and offer advice if there is any good reason for all the talk about her. But stop it she must—and does.

Sometimes trouble at home makes a girl desperately unhappy. There may be unexpected doctor's bills that she does not have the cash for. Or marital troubles. Or perhaps she is worried about her children. Domestic problems like these often come to the attention of the matron and she soon learns how to speed the difficulties to a quick solution by direction into the proper channels.

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Safeguarding the Newcomer

Accidents and illness cost the war effort many millions of precious man-days last year. This appalling waste of manpower must be stopped. It is industry's bounden duty to make its plants safe for the millions of men and women on the production front

—Donald M. Nelson
Chairman, War Production Board

With new employees constantly entering industry and with older workers taking on new jobs, many accident prevention programs that were effective in normal times are today being revamped, or wholly new programs are being introduced. This company, whose problems concerning newly placed workers doubtless typify those faced by many other firms, recently discovered, for example, that approximately 60 percent of all its accidents were involving new employees, and that 75 percent of these accidents occurred in the first 90 days of employment. Moreover, with our total number of employees expanding and with employment at one plant mounting faster than at another, the use of a continual promotional system had created a double-barreled accident hazard—in shifting an old worker to a new job and in filling his position with a new employee.

Up to the Foreman

Under such conditions, when introduction of a wholly new program might have resulted in a temporary dislocation, we found it expedient to intensify our entire safety program, at the same time redirecting our safety educational methods so as to reach more immediately this particular group of accident-prone employees. Basically, this involved placing greater responsibility on the foreman in teaching safety to the new employee right on the job and making each worker more safety-conscious from the moment of his induction.

By concentrating our educational efforts upon this particular group, we substantially reduced the accident frequency within it, and, by so doing, furnished tangible evidence to all workers that accidents do not distribute themselves merely by chance, but can be prevented.

Since new processes, new materials, and new equipment were constantly taking shape to meet the fluctuating requirements of war production, periodical surveys of the physical plant had to be replaced with a continuous, around-the-clock investigation. To accomplish this, in the face of multiple working shifts, and also obtain maximum supervision over each employee, we created a system of four-men safety committees, one for each shift in each department, to spread the safety gospel throughout the plants.

These committees are headed by the department foremen, to whose discretion appointment of the safety committeemen is largely left. The latter, identified by a badge, are charged with noting all unsafe practices or unsafe pieces of mechanical equipment and instructed to report such discoveries to the foreman.

Since these "safety detectives" are usually older, experienced operators to whom new employees naturally turn for advice, special precautions have been taken to insure that their interest in accident prevention never falters. We try to bolster their enthusiasm at frequent intervals through addresses by the safety director and motion pictures describing the latest industrial safety principles, each showing varying in subject matter as much as possible.

The new employee gets his first contact with safety principles at the employment department where he is given a letter explaining the company's

Every worker at Minneapolis-Moline Power Implement Company wears shatterproof goggles while in the plant. So do visitors. All employees are fitted with goggles ground to their requirements

By GEORGE B. MILLIGAN, Safety Director, Minneapolis-Moline Power Implement Company, Minneapolis.

general safety policy. The employee safety organization is outlined to him, and he is told that he should consider himself an integral cog in the entire program, that management pays him to work safely and to follow instructions and will provide him with adequate personal protective equipment, as well as mechanical guards, wherever the slightest accident hazard exists. A rigid physical examination is essential.

Just now, in an effort to spread the use of safety shoes, we are paying a dollar to every worker who buys a pair of the approved type—capable of supporting 2000 pounds on the steel toe-caps. Two doctors are available to test every worker's vision, and every company employee must wear shatterproof goggles while in the plant. Visitors are no exception to this rule.

Each new worker also learns about the plant hospital, with its staff of nurses on duty 24 hours a day. He is repeatedly urged to report there upon the most minor injury, for even a sliver or scratch may—and often does—result in serious complications and lost man-hours.

Ready for Instruction

The new worker is then ready to undergo instruction in the performance of his assigned work. This constitutes the crucial point in our current accident prevention program. While some concerns handle this task through training schools or a safety supervisor, we issue safety instruction through the department foremen. Occasionally an older worker may be assigned to do this teaching, but generally the foremen undertake the task. In one of our departments, for example, where induction of new workers is constantly taking place, a small group of foremen do little else but supervise the training of new men.

Since education on the job has now become the cornerstone of accident prevention in our concern, it is more vital than ever before that foremen *know how to instruct*. Failure to explain every potential hazard comprises one of the principal causes of accidents among newly placed workers. Foremen are therefore expected to break down each operation whether it requires the lifting of a steel casting or the running of a power press. Preferably, foremen should go through the entire job themselves, pointing out each hazard, watch the new employee as he takes on the job to prevent development of inefficient or hazardous habits, and review procedure from time to time.

TO THE NEW EMPLOYEE

This Company has a safety organization for the purpose of protecting its employees from injury, as well as from conditions injurious to health. Every employee is considered a member of this organization. We will expect you to work safely at all times and comply with all rules and regulations on safety. If you don't know the safe way to do a job, ask your Foreman, shop safety committee man, or some older employee. The following are some of the more important rules:

1. Report all injuries at once to the Plant hospital
2. Goggles must be worn at all times
3. Oiling, cleaning, repairing, or adjusting machinery must be done while such machinery is not running
4. Scuffling, wrestling, fooling, or throwing things is forbidden
5. Never run in the Plant except in an emergency. Walk and watch where you are walking
6. Material and equipment must be piled in a safe and orderly manner. Many of our accidents are due to careless piling and handling of material
7. Safety shoes will prevent many broken toes. See your Foreman or safety committee man, and they will tell you where they can be purchased
8. No machine is to be operated unless the employee has been told to do so by his Foreman or unless it is part of his regular job

We want you to help us eliminate accidents from this Plant. We will appreciate your cooperation in making this a safe place to work.

SAFETY DEPARTMENT

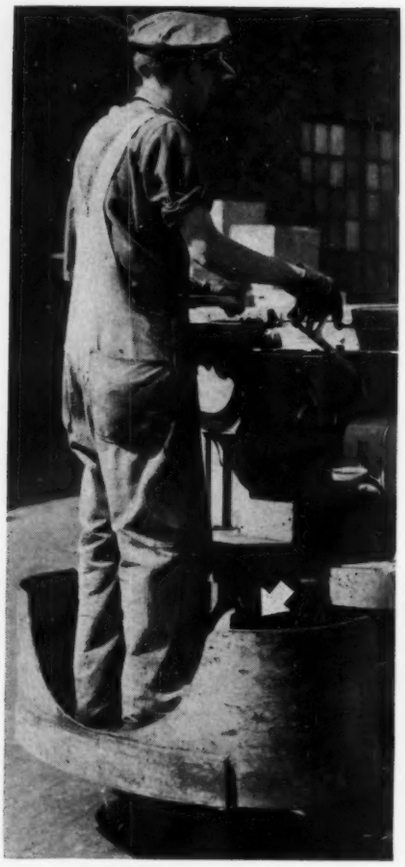
Newly hired workers get their first lesson in safety in the employment department where they are given a letter outlining company policy and containing general safety rules that must be followed

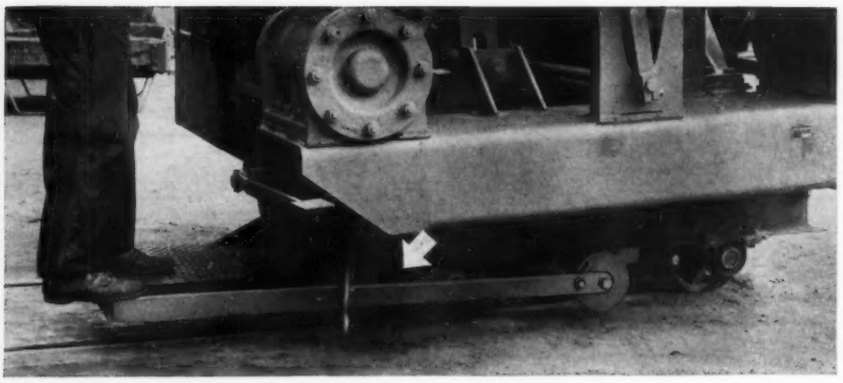
In these days of increased pressure to get the work out, newly hired men are especially prone to find a short cut or attempt unauthorized work. Such infringements must be continuously guarded against and firm discipline applied for every infraction of the rules. Foremen themselves receive instruction in teaching technique by attending sessions of the Training Within Industry Branch of the War Production Board, a training organization which cannot be too highly praised. They are also urged to attend locally sponsored industrial safety conferences, receive a monthly pamphlet on safety and periodic letters from the safety director, and hear occasional addresses from the president of the concern.

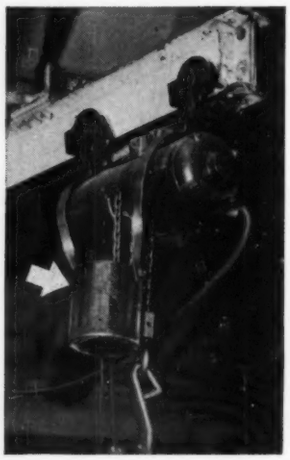
Obviously, under a system where safety education begins with the foreman, he must also be given primary responsibility for finding out why a particular accident occurred. Our foreman's accident report, while it compels constructive thinking in presenting all the major facts of causation—mechanical or physical hazards, the unsafe act, probable reason for its commission, and contemplated remedial action—represents, nevertheless, the foreman's point of view.

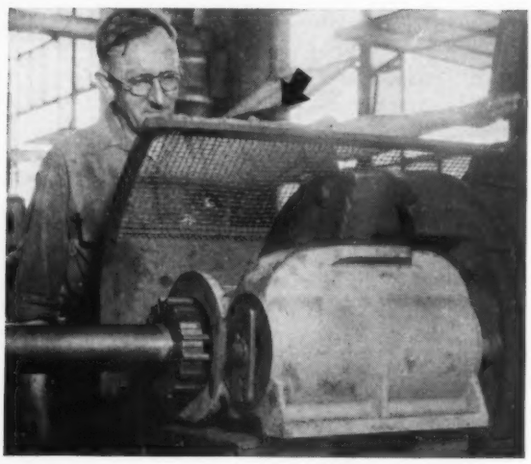
This report, because of variations in personal judgment, is not always a reliable index to the cause of an accident. When any doubt exists as to this cause, our medical report, based on the employee's side of the story, is brought into play. Combination of these two reports, followed up by the safety director's on-the-spot investigation, usually obtains a complete and accurate picture.

To illustrate, a man was recently hired to operate a grinder. Shortly afterwards he ground off parts of two fingers. The day operator, who had trained the man, reported that he









Typical safety measure at Minneapolis-Moline include rear platform guard on power trucks, safety brake mechanism, also for power trucks, receptacle for surplus chain on electric hoists, and a heavy mesh guard set in machine bed to protect operator from hazard created by revolving chuck

had repeatedly warned him to shut off the machine before removing the work. The new employee asserted that he had slipped on an oily floor. Later the safety director learned that this man had been in the habit of telling other experienced operators how to run their machines This, combined with the foreman's report, indicated a personality fault, and proper corrective action was then taken.

Exchange of Ideas

Adequate fact-finding involves a continual interplay of ideas between foremen and the safety director. Foremen, accordingly, are made directly responsible to the safety director for preventing accidents. They meet with him once a month, in company with the shop superintendent, to transmit suggestions, report on unsafe practices, and go over the accident records.

These meetings thus serve a twofold purpose, by compelling foremen *to report to us* on unsafe conditions and allowing us *to report to them* just what specific suggestions previously made have been carried out. When immediate execution of a suggestion proves infeasible, we ask for alternate solutions. Once the remedy is decided upon, the safety director holds himself responsible to the foremen to carry that suggestion to the maintenance department and see personally that it is carried out.

Frequently, for example, the influx of new employees may reveal hazards that were not known to have existed before, or, if they were known, had not been reported.

As an illustration, a load of beams was recently being hooked up to a crane by two new employees. The crane operator pulled up the chain without receiving a signal, nearly causing the beam to strike one of the workers. Investigation disclosed that signaling had not been a standardized procedure and had not been taught to each new worker. Rather than blame the crane operator, who was merely doing his job as always, we installed a system of signals to be used thereafter. Posters were placed in the cabs of all crane operators and also on all bulletin boards where other men, who might perform the loading operation, could readily see them. Meanwhile the safety director dispatched a letter to the key foremen explaining the new procedure.

Employee morale is hard to build, easy to tear down. All workers, particularly new men, tend to imitate their superiors. If the confidence of supervisors or older men is weak, that lack of faith will be reflected by every worker with whom they come in contact. Bulletin boards, scoreboards, rule books, and all the other tangible devices that help to keep safety uppermost in the minds of employees lose all their effectiveness when management neglects to act on construction suggestions by employee for improvement.

In the urgency of getting out war material, management may find it increasingly difficult to reach the individual employee. Yet closer contact is vital to efficient production. Accident prevention work is one means of building good will between management and workers. And taking immediate remedial action on hazardous conditions is probably the most powerful device that management has to prove its interest in safety programs and, accordingly, the personal welfare of its employees.

Health and Safety Shorts

Licensed Drivers to Make Plant Roadways Safer

As the manufacturing plants at Bell Aircraft, Buffalo, grew larger and larger, with more and more people in the aisles moving from department to department, and transportation problems developed inside the plants, the traffic situation in plant aisles and on driveways on company property became serious.

Large plant areas require that small trucks and tractors travel as fast as safety will allow, so that parts can be delivered without unnecessary delay. Under ordinary factory procedure, when an unskilled laborer takes over a job on a tractor or truck, little thought is given to his capability for the job he has to do, from a safety standpoint. Bell Aircraft has set up a system licensing all vehicle drivers who are assigned to such work. All employees who may have to drive such a vehicle are given special safety instruction, as well as instruction in the operation of the equipment. After completing the instruction course, they are given an examination, and a license —if they pass it.

This method makes it possible for the company to exercise effective control over the drivers and, through the vigilance of the police department as well as the safety and traffic departments, the rules concerning protection of pedestrians and other trucks are enforced. The possibility that the company will hold the drivers responsible for negligent operation of this equipment makes them definitely safety-conscious.

Employee Committees Cut Accidents 36.5 Percent

Under a program launched in our plant on the first of May, 1942, the number of accidents during August decreased 36.5 percent over the preceding month, and the downward trend is continuing.

It has never been the policy of our company to use the "must or else" theory in dealing with problems affecting employees, but rather to encourage them into doing better things in a better way by education and by recognition of their cooperation. We saw no good reason why this theory could not be applied to our safety program.

The question was first how to acquaint the workmen with the situation. Figures are dull reading, so two sets of charts were made up—one showing the total number of accidents compared with the total number of employees each month for the entire plant, the other showing the number of accidents compared with number of employees for each department. The chart for each department was posted on the safety bulletin board beside the one for the entire plant.

We then set about organizing safety committees. Selection of who was to serve was left almost entirely to the workmen, and the members choose their own chairmen. The plant is operating on a 24-hour schedule, so a similar set-up was established for each shift. As the committees were formed, the chairmen on the different shifts were called to the safety division office where they were given brief instruction pertaining to safety work, and furnished with badges for all the members of their committees.

By July 1 we had eleven departments organized, and then things began to happen. Our accident curve began to show a downward trend. A survey showed that ten out of eleven of the departments in which committees had been set up had fewer accidents over the previous month.—*Frank Dedrick*, Safety Director, The Bullard Company, Bridgeport.

Patch Test Aids Fight Against Tuberculosis

Employees at the General Tire & Rubber Company, Akron, can work with no fear of contracting tuberculo-

Members of a department safety committee call on a man found working without his goggles, point out dangers, give him new pair

Patch test is used at General Tire & Rubber Company to indicate presence or absence of TB germs. "Positives" are then fluoroscoped

sis from their fellow-workers. A recent company-wide test shows no active cases.

Instead of the more usual method of fluoroscoping everyone—suspected or not—all employees first submitted to the "patch test," which indicates the presence or absence of the tuberculosis germ in the body. Even though the reaction to this test may be positive, it does not mean that the subject has an active case of TB. This was conclusively proved to General workers when fluoroscopic examinations of all employees whose reactions were positive showed not a single case of communicable tuberculosis.

Contest Helps Set New No-Accident Record

Our safety program is based on the principle that it is the responsibility of all ranks of supervision to make accident prevention a part of their everyday effort. We therefore fight shy of sporadic stunts.

However, one Johns-Manville factory merged the competitive spirit of the employee group with the interest of some of its supervisors in accident prevention, and hung up a fine no-accident record during the first six months of 1942.

Three of the supervisors had completed one of the U. S. Office of Education courses in Industrial Safety Engineering early in January. They obtained the manager's approval to divide the various departments into three evenly matched groups. Each of the three men became a "safety captain." Accident prevention was still the job of the foremen, but it was up to the "safety captain" to apply his newly acquired knowledge, through the foremen, in order to make a good showing.

The captains learned what a job it is to keep another busy supervisor interested in such bothersome details as guard maintenance, use of goggles and safety shoes, and good housekeeping. Each foreman was interested in seeing his particular "captain" come through with top honors.

There were two lost-time accidents during the six-month period—both within the same group—both "tough luck." The banquet promised to the winners had to be extended to two groups, and a good time was had by all.—*O. L. Binder*, Health and Safety Engineer, Johns-Manville Products Corporation, New York.

Optical Service Cuts Number of Eye Injuries

An experiment begun early in July, 1942, at the Nashville Division of Vultee Aircraft has proved so successful that the plan has been installed as a permanent feature of the safety program.

This plan is a full-time optical service for employees. Formerly employees checked goggles and other protective equipment out of the tool crib hit or miss. Now an experienced optician is in charge. He issues all eye-protective equipment, determines what type is needed for the particular job, and makes sure that it fits the employee for comfort and full protection. One month after this service was inaugurated, the number of eye injuries was reduced 10 percent.

The optician is responsible also for the sterilization and maintenance of eye-protective equipment. He is stationed at a central location in the factory, and is available at any time for proper adjustment or repair of personal spectacles and safety goggles. He also makes surveys of various operations for lighting specifications, and to determine the need for various types of personal protective equipment.

Dramatizes Accidents to Encourage Safety Shoes

Pictures are used effectively as part of a special drive to get women war workers to wear safety shoes. A page in the employees' magazine lists six "simple rules to protect your feet," points out that 26 percent of injuries in the plant are confined to the feet, shows (1) a pair of good-looking safety shoes, (2) "how foot accidents pop right out of a clear sky." The photograph directly below is one of two well-staged pictures that tell how it all happened. —Source: Winchester Repeating Arms Company, New Haven, Conn.

Winchester urges safety shoes for women war workers by dramatizing foot accidents

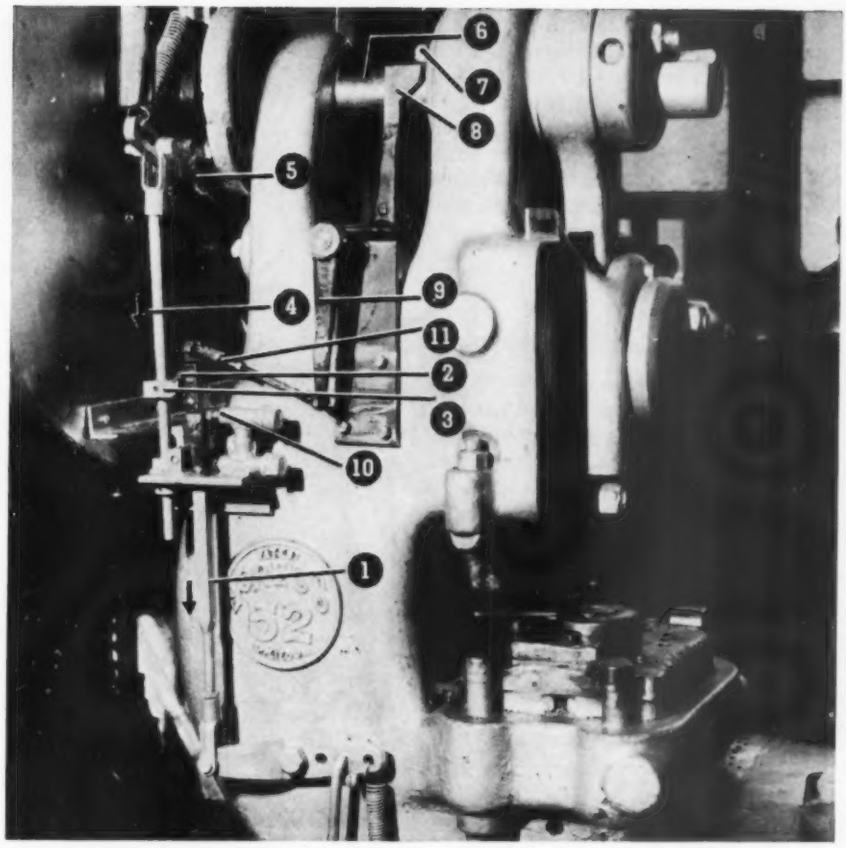
Press Control Compels Safe Operation

Because we found it necessary to limit the operation of a machine to a single punch, regardless of the length of time the foot pedal is depressed, and to require the operator to go through the same procedure for each operation, the arrangement shown in the photograph was evolved:

Rod (1) is hooked up to the foot treadle. Upon applying pressure on the treadle, rod (1) through hook (2), block (3), and rod (4), releases the clutch (5), permitting shaft (6) to rotate and the punch to operate. On shaft (6) is pin (7) which, upon turning one revolution, engages the tapered side of lever (8). When pin (7) engages lever (8), it causes lever (8) to be moved, which, through connection with bell crank (9) and adjustable rod (11) causes the contact between hook (2) and block (3) to pull out of engagement. This releases rod (4) and allows spring on clutch (5) to release the clutch pin, immediately stopping the rotation of shaft (6). By adjusting the length of rod (11), the throw of tapered lever (8) —by pin (7)—can be arranged to permit one full revolution of shaft (6), and consequently only one punch, at reapplication of clutch (5).

Hook (2) is re-engaged with block (3) by stepping on the treadle again, when rod (1) raises, allowing the rounded top of hook (2) to slide over the rounded bottom section of block (3) and causes hook (2) to engage with block (3) through pressure of the spring plug in tube (10).

This hook-up was handmade to do a particular job. It has been in operation for several years and, although it may be subject to refinement, it has proved satisfactory. We believe it definitely represents a safety factor. —*E. Henry*, Foreman of Tool Cribs, J. G. Brill Company, Philadelphia.



Simple control allows one punch only, prevents accidents

Uses Plant Paper to Sell Health and Safety

One way to educate workers in health and safety is through the plant magazine. In a recent issue of *GM Folks*, for instance, an article entitled "Accidents Help the Axis" stresses the point that serious accidents are often caused by failure to wear helmets, goggles, face shields, asbestos leggings, steel-toed shoes, and fireproofed aprons.

"What not to do" photographs posed by GM folks show the lathe operator who wears a tie at his work, the floppy soled shoe, the open toe and high heel shoes that are so dangerous when worn in the shop, finger rings, the horseplay enthusiast who is not content to take chances himself, but also jeopardizes the safety of others by playing with an air hose.

General Motors uses photographs to point out *what* to do (top) . . . and (bottom) what *not* to do

The positive approach is also used —for example, one photograph shows a pair of well-lathered hands, with the statement that the use of plenty of soap eliminates the possibility of dermatitis.—*Source:* General Motors Corporation.

Promotes Use of Goggles by Publicizing Accidents

We were having some difficulty in getting new employees in our cleaning and finishing department to wear safety goggles. Shotblasting, grinding, and chipping of steel castings are done in this department. With so many more men working, the necessity for their wearing goggles was greater than ever. Eye injuries due to flying steel particles were on the increase.

We frequently had cases where men's eyes had actually been saved by their goggles. In an effort to reduce eye injuries, we photographed each of these men wearing goggles with the shattered lens. These pictures are posted on the department

safety bulletin board, with an appropriate message calling the attention of all employees to the importance of abiding by the "goggle rule."

That this plan is effective is proved by the decided decrease in the number of eye injuries.—*James F. Ewing*, Safety Director, The Symington-Gould Corporation, Depew, N. Y.

New Lab Aids War on Occupational Disease

A laboratory, fully equipped for blood and urinalysis, blood cultures, and chemical analysis to prevent and diagnose occupational diseases, plays a major part in the program to keep workers at their top productive ability at Caterpillar Tractor Company, Peoria, Ill. With the cooperation of the United States Public Health Service, this company is helping industry to fight against syphilis. A trained technician is in charge.

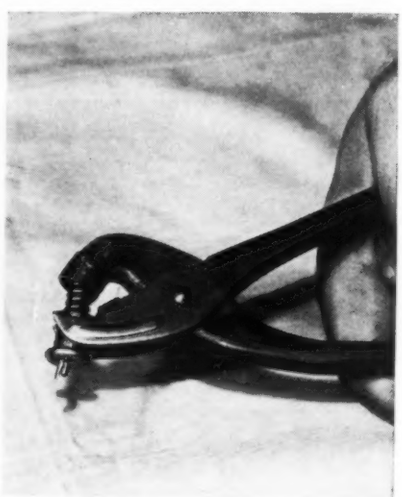
In the physiotherapy department infra-red, diathermy, and ultraviolet machines are available for injured employees, and massage is given by a trained physiotherapist.

The safety and medical departments make a constant check for chemical and dust hazards, so that the employees' health is continuously safeguarded. — *Source:* Caterpillar Tractor Company, Peoria, Ill.

Safety Bulletins Travel Through the Shop

Bulletin boards must "stay put," but safety posters on power trucks travel all over the shop. Supplies of weatherproof messages are painted and held in stock at the Westinghouse Louisville Ordnance Division, and frequent changes are made. A dozen or more posters are usually seen before duplication occurs.

A trained physiotherapist treats injured employees in medical department where infra-red, diathermy, and ultraviolet are available



Special Pliers Stop Skin Fasteners From Flying

After several injuries had been sustained from flying fasteners, an attempt was made to find a more suitable plier or gun. Experiments were made with different types of tools, and trials were made of fingers and claws welded to the pliers. Photograph shows the skin-fastener pliers finally evolved. A welded cup prevents the fasteners from flying out of the pliers when they are being inserted or removed from the skins. Many of these special tools are now in use; they have been the means of eliminating a very real cause of accidents.—*Source:* Curtiss-Wright Corporation, Buffalo.

Messages on power trucks spread safety gospel into far corners of the plant

Significant Labor Developments

Period surveyed: November 10 to December 10

TREND INDICATORS

Further Extension of Belo Plan

Further use of the Belo plan has been sanctioned by the Circuit Court of Appeals when it upheld an agreement to pay 34 cents an hour for 40 hours and 51 cents an hour for 20 hours of overtime with a bonus to bring total pay to the same as previously received, when employees received 40 cents per hour for 60 hours. The agreement was actually made and the employer's books showed that the projected computations were made. (Murray vs. Noblesville Milling Co.)

In another case, the Court refused to sanction a wage arrangement when it found that the intention of the parties was to cover both straight-time pay and overtime pay. Such a general intention, concluded the Court, does not qualify as an agreement that the straight-time rate shall be at least equal to the minimum established by statute and that overtime shall be paid at the rate of time and one-half the regular rate. The plan is therefore ruled inadmissible as a defense to charges of violating the law. (Walling vs. Stone.)

WMC Given Sweeping Authority

In further pursuit of the expedient of avoiding Congressional delay, a new control was promulgated by Presidential Order. Authority over manpower is vested in Paul V. McNutt, as to all hiring for military needs and general supervision looking to the prevention of labor piracy. His first major move to end pirating and switching was to freeze 660,000 workers in the Detroit area. While it is insisted that the plan is a "voluntary" one, the methods of enforcement leave little doubt as to the sanctions behind the Commissioner's orders. The district office of the War Manpower Commission recommends that no worker leave his present job for another without a clearance from his employer or from the district office. Public opinion, the threat of withholding payments on a government contract, if the employer has one, and the restriction in flow of materials are sufficient to give the order more than a voluntary nature.

Employee Cannot Waive Right to Overtime

In denying the employee's right to settle overtime for a lesser sum than was due under the law, the Court reiterated its policy that "where a right has been given to an individual not alone for his private interest, but also as a matter of public policy, in the interests of the State it may not be waived by anyone," (Greenbaum vs. Meadow Provision Company), even though there was an honest dispute as to the overtime. (Ruben vs. Meadow Provision Company.)

Disputed Claim Settled Without Damages

A Federal District Court ruled that a settlement of a *disputed* claim would prevent the employee from seeking an equal amount of liquidated damages. Had there been no dispute, the Court pointed out, there would have been merely a payment of back wages, not a settlement, and the employee would be entitled to an equal amount as liquidated damages provided by statute. (Calf vs. Gonzales.)

However, the employee may not waive his right to recover back wages and liquidated damages by accepting a smaller amount in full payment, even though there be an honest dispute as to the amount actually owed. (Rodriguez vs. Corporacion Azucarera sauri y Subria.)

Overtime When Two Jobs Are Involved

Employers may now compensate an employee working under two or more rates for his overtime under the Wage-Hour Law and the Walsh-Healey Act at *either* time and a one-half his average hourly earnings for the entire work week, or time and one-half the hourly or piece rate at which he was employed during the overtime hours.

Contracting for Overtime

Any regular rate of pay may be chosen, provided it is above the statutory minimum and is agreed upon by contract. In this manner, the rate of overtime may be so fixed as though there were no Wage-Hour Law. In this case, the contract called for payment of the minimum allowed by statute, namely 30 cents an hour, with overtime actually amounting to several times the straight time rate. (Atlantic Company vs. Walling.)

Government Corporation Under the Act

The activities of a federally owned corporation being similar to those of a private employer, the Reconstruction Finance Corporation was required to pay back wages under the Wage-Hour Law. (Merryfield vs. F. M. Hoyt Shoe Corporation.)

Prime Contractor Responsible for Compliance With Walsh-Healey Act

The extent to which a prime contractor may be held responsible under the Walsh-Healey Act for infraction of the law committed by his manufacturer is illustrated by a ruling of the Public Contracts Division Examiner that the prime contractor is liable for liquidated damages under the Walsh-Healey Act for minimum wage and overtime violations committed by his substitute manufacturer.

While the Act does not apply to subcontractors, ruled the Examiner, it covers substitute manufacturers who produce part or all of the articles ordered by the contract with the government; and the prime contractor is liable for any violations of the contract stipulations by the substitute manufacturer.

The prime contractor, the Examiner concluded, could not escape this responsibility by claiming that the substitute manufacturer was selected by him on the recommendation of the Army Quartermaster Corps and without any knowledge of his methods or the manner in which he performed his contracts.

Penalty for Disobedience

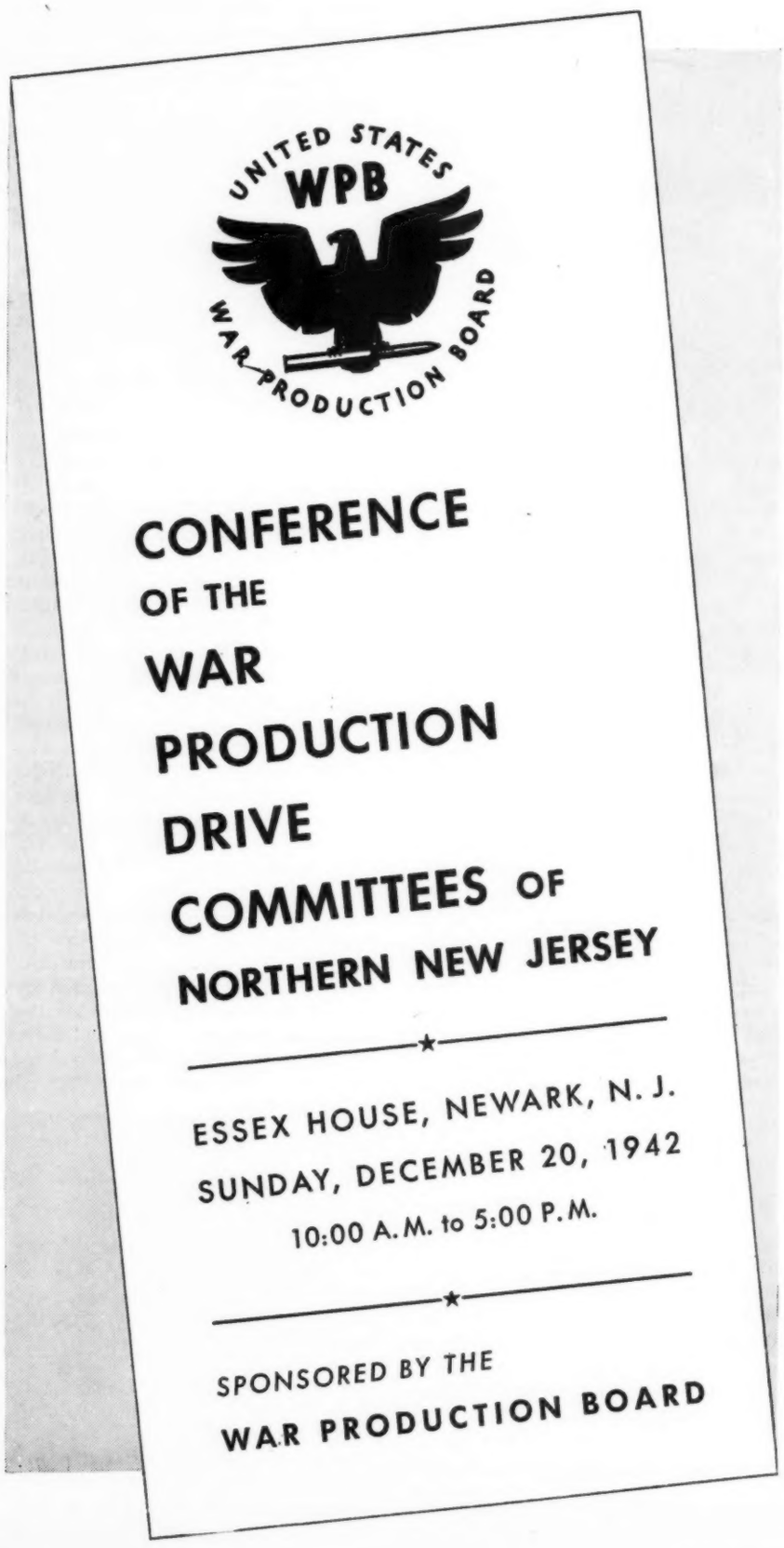
A Federal District Court (San Juan, Puerto Rico), having found an employer guilty of contempt of court for disobedience of its order to comply, sentenced him to a term of six months' imprisonment which he could escape by paying restitution totaling some $21,000 within four days.

Issuance of Subpoena Restricted

When the Wage and Hour Administrator issues a subpoena for production of records to determine whether the Wage-Hour Act has been violated, he must, according to the

(*Continued on page 204*)

How Local Companies Shared



IF THE WAR PLANTS of Northern New Jersey set a new high record for increased production in January, credit the War Production Drive Committees of that area with an assist. More than 450 members of these committees spent the entire Sunday of December 20 in a conference sponsored by the War Production Board, and called for the express purpose of swapping ideas and sharing experiences.

The plan is one that may readily be adopted by labor and management in other sections, and an outline is given here for the benefit of those who wish to put a good idea to work in their own communities.

Sunday was chosen for the meeting so that committee members might attend without taking time off from their regular plant duties.

"Everyone wants to do his part. I start all my thinking from this conviction. The problem, therefore, is to give *everyone* a job to do, and to find ways to make his *best* count *most* on that job. That is the thinking behind our national war-production drive"

— Donald M. Nelson

It was the disappointing tenor of the report of October production figures that lead a handful of New Jersey people to "take steps." A sponsoring committee was set up (see list on facing page), six of its members representing management, six labor. An all-day session was planned, and the following New Jersey companies agreed to act as luncheon hosts: Thomas A. Edison, Inc., Federal Shipbuilding & Dry Dock Company, Gould & Eberhardt, Walter Kidde & Company, Inc., Titeflex Metal Hose Company, Westinghouse Electric & Manufacturing Company, and Weston Electrical Instrument Corporation. It was FACTORY's privilege to be one of the hosts at the luncheon.

The conference consisted of an opening session from 10 to 11 a.m., followed by group meetings from 11 a.m. to 3.30 p.m. (with luncheon re-

Production Drive Experiences

cess from 12.30 to 1.30 p.m.), and a closing session from 3.30 to 5 p.m.

Chairman of the opening session was Philip Turnbull, Special Assistant to the Regional Director, War Production Board, Region II. Subjects discussed and speakers were:

"Labor, War Production, and the Community," Hon. Vincent J. Murphy, Mayor of Newark and Secretary, New Jersey State Federation of Labor.

"An Employer's View of the War Production Drive Committee," Thomas Roy Jones, President, American Type Founders, Inc.

"The War Production Drive Headquarters in Washington," W. Ellison Chalmers, Acting Chief of Staff, War Production Drive Headquarters, Washington, D. C.

"The Labor-Management War Production Drive Plant Committee," George S. Pfaus, Assistant Regional Labor Representative, War Production Board, Region II.

Four group meetings, each lasting from 11 a.m. to 3.30 p.m., with time out for luncheon, followed immediately. Subjects discussed were:

Group 1—Suggestions and awards: publicity (posters, production charts, rallies, etc.).

Group 2—Conservation, salvage, care of tools and equipment; production problems (bottlenecks, quality, changes of methods and materials).

Group 3—Absenteeism; safety and health measures.

Group 4—Transportation (car clubs and gas rationing).

Chairman at the closing session was Thomas E. Maguire, Regional Labor Representative, War Production Board, Region II. Subjects discussed and speakers were as follows:

"The Controlled Materials Plan," Robert R. Nathan, Chief, Planning Committee, WPB, Washington, D. C.

"Management's Responsibility in the War Production Drive," John W. Nickerson, Chief, Management Consultant Branch, Labor Production Division, WPB, Washington, D. C.

"Conclusions of the Conference," Irving Abramson, President, New Jersey State Industrial Union Council; Valentine J. Hill, Vice-President, Walter Kidde & Company, Inc.

SPONSORING COMMITTEE

★

Joining with the War Production Board as co-sponsors of the Conference are:

DAVID CLYDESDALE, Grand Lodge Representative, International Association of Machinists

VALENTINE J. HILL, Vice-President, Walter Kidde and Company

CARL HOLDERMAN, Regional Director, Textile Workers Union of America

ELVIN HOLLANDER, JR., General Manager, Star Electric Company

ELBERT HUSTED, President, Titeflex Metal Hose Company

ALBERT HUTLOFF, Business Manager, Local 52, International Brotherhood of Electrical Workers

SAMUEL ISARD, New Jersey Director, American Federation of Labor

JAMES McLEISH, District Representative, United Electrical, Radio and Machine Workers of America

E. R. MELLEN, Vice-President and Treasurer, Weston Electrical Instrument Corporation

GEORGE MUFSON, Representative, United Steelworkers of America

ARTHUR WALSH, Executive Vice-President, Thomas A. Edison Industries, Incorporated

WILLIAM F. ZIMMERMANN, Works Manager, Gould and Eberhardt, Incorporated

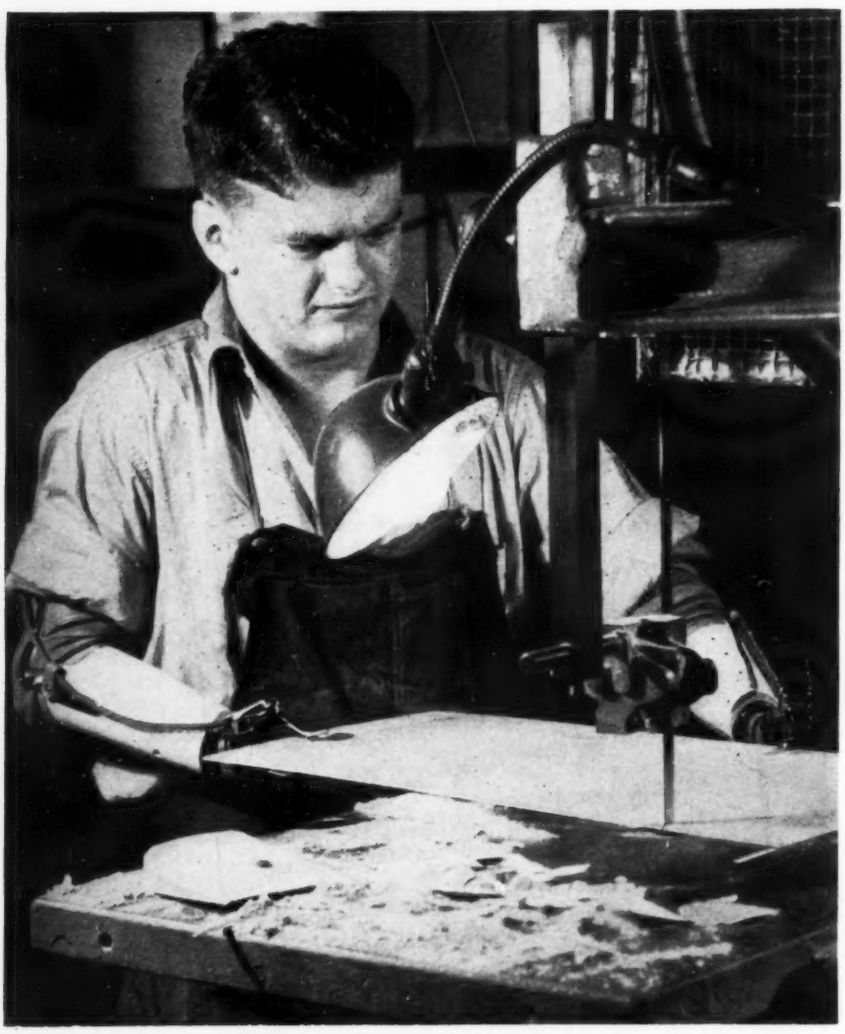
We Hire Men and Women Who

Wartime necessity for fullest utilization of the nation's manpower now focuses attention on a virtually untapped source—the thousands of disabled men and women who have been trained, or can be trained, for regular factory work

RAY TRAUTMAN, President, Minneapolis Artificial Limb Company, Minneapolis

OUR PRACTICE OF HIRING and training virtually no one but physically handicapped men and women for factory work, for office routine, and for field-sales activities is now of 28 years' standing. It is a policy that grew out of a pet theory of ours that craftsmen actually wearing braces or artificial appliances were in position to be the most conscientious and industrious, not only in selling, but also in manufacturing such devices. This policy has today resulted in a payroll of 145 employees, 95 percent of whom are physically disabled in one way or another. Collectively, they wear 175 artificial legs, arms, or braces.

The disabilities of these workers are all of a permanent nature and vary in type and degree of seriousness from amputations requiring prosthesis below and above the knee or elbow, to limb paralyses caused by poliomyelitis or spinal injuries. The numerous manual operations these workers perform are every bit as exacting as those usually found in industrial plants. The machines these men run include lathes, electrical welding equipment, blacksmith's forges, drill presses, bandsaws, sandpapering and polishing machines, spray-paint guns, to mention but a few.



Albert Wenger, victim of a North Dakota blizzard, has lost both legs and parts of both arms. Now he runs a bandsaw or a sander, drills holes in fiber, ties heel cords, polishes fiber and metal

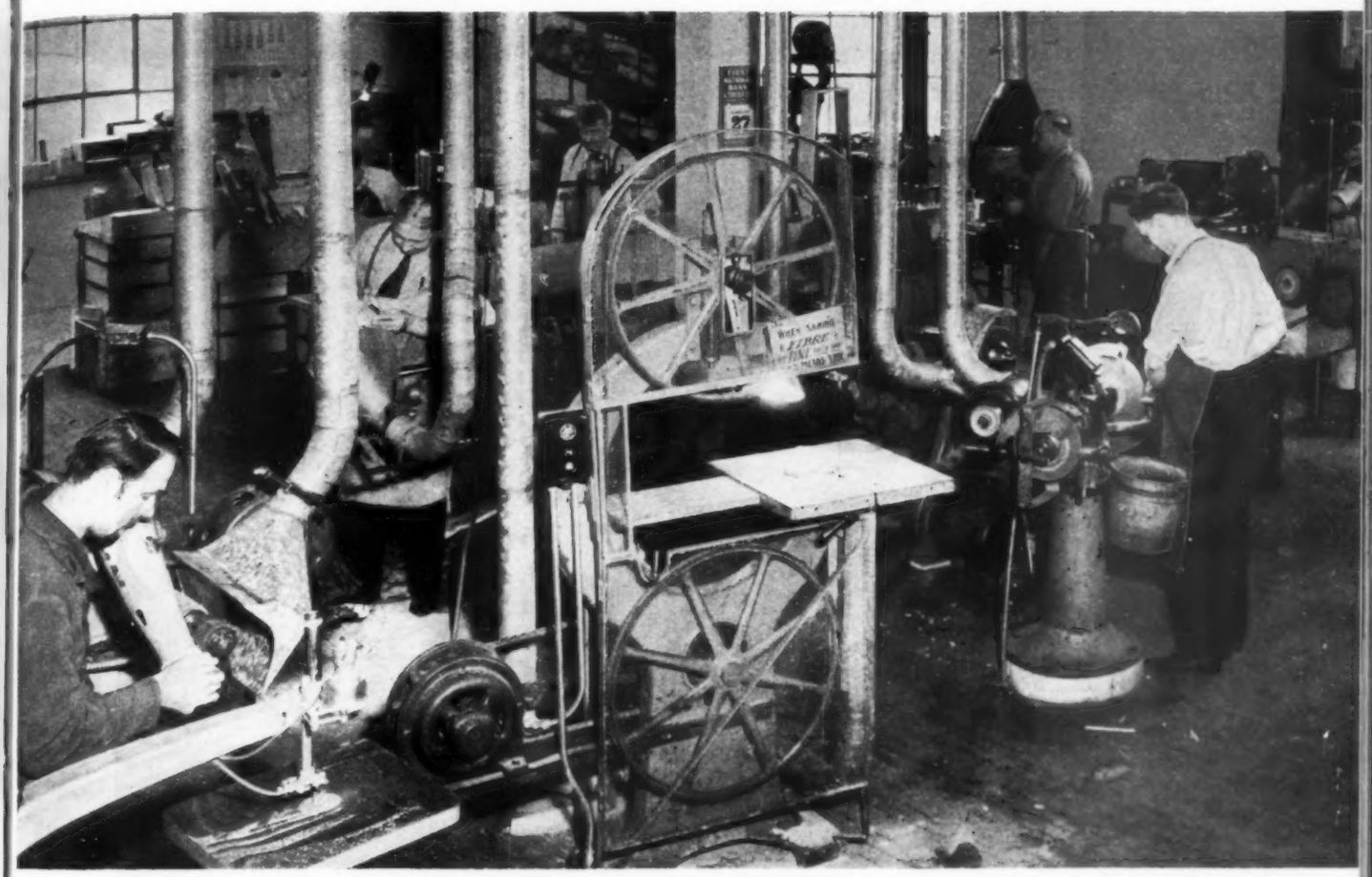
Originally, we recruited our workers from the ranks of disabled men and women whom our products had helped. Since 1920, however, when the federal government inaugurated a program of vocational rehabilitation of persons disabled in industry or otherwise, nearly all our employees have come through channels of our state's division of vocational rehabilitation. A primary function of this state agency is to weed out for rehabilitation only those vocationally handicapped persons whose age, extent of physical disability, and attitude of mind render rehabilitation feasible. (Rehabilitation agents are not miracle workers; there is a considerable group of the disabled for whom it is futile to attempt rehabilitation service.)

Expertly Analyzed

For us, this has meant in effect that seldom if ever is a handicapped individual referred to us for employment whose aptitudes and general capabilities have not been expertly analyzed beforehand. It means also that every applicant for work in our shop or office is in the best physical condition to which medical science can restore him. If a person requires an artificial appliance, the state's division of vocational rehabilitation provides one; if on the other hand an operation is needed, this also is provided.

The state pays us $20 to $30 a month per applicant during the period he is being trained. The training period may last six months for a single

Are Physically Handicapped



Collectively the 145 workers in this plant wear 175 artificial legs, arms, or braces. Despite their physical handicaps, they run lathes, welders, drill presses, bandsaws, sanding and polishing machines

amputation. For the first 30 days we, in turn, pay the trainee 40 cents an hour. Following this period, he receives a union-set rate of pay—65 cents for a third-class mechanic; 75 cents for a second-class mechanic; 85 cents for a first-class mechanic; and up to $1 for highly skilled help.

Each new employee produces as he learns. Since a good proportion of our advanced shop work requires the utmost in skill and delicate handling, each new worker is assigned to a certain department where he begins by performing the simplest operations in that department, and then gradually taking on more complex tasks. One department, for example, is devoted to the manufacture of artificial arms; another to braces; another to metalware; still others to enameling and finishing. Each new man is supervised by the shop foreman and the man in charge of the department where he is being trained.

From the standpoint of rehabilitation, our physically disabled employees can be divided into two groups: (1) Adult workers whose problem is primarily that of readjustment in our shop to an occupation somewhat similar to that pursued before the disability occurred; (2) young workers whose problem is that of special training to enable them to perform operations comparable to those done by normal individuals, yet without the use of a normally healthy arm or leg.

Worker's Attitude

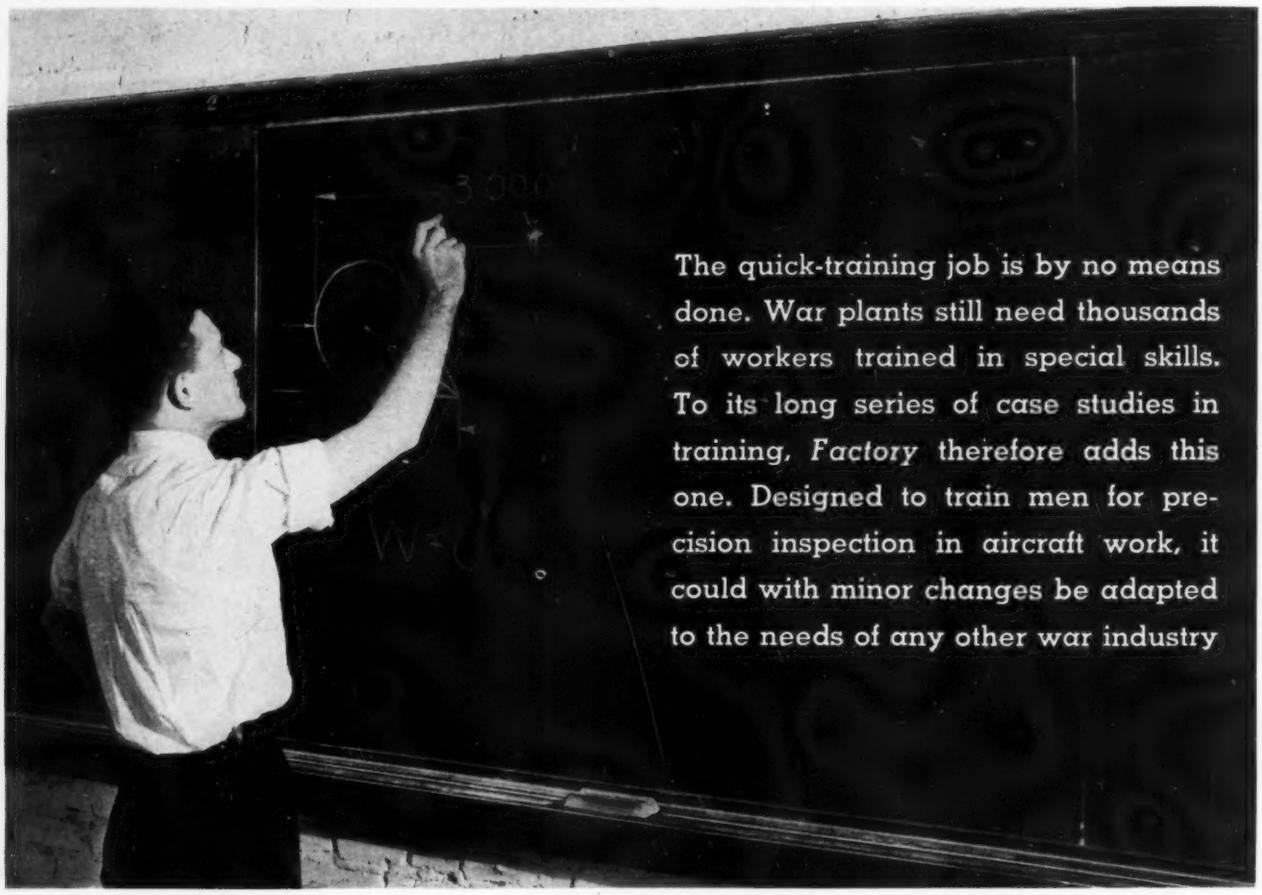
In undergoing training or readjustment to a new occupation, probably the most important single factor leading to successful rehabilitation is the worker's own attitude of mind. A man who, because of his disability, doggedly refuses to believe he can ever again do useful work is, by and large, a poor risk for rehabilitation. The man who, despite his physical limitation, sincerely believes he can do efficient work will on the other hand often amaze his most skeptical observers.

To illustrate this point, let me cite the case of Albert Wenger, one of our youngest, newest, and most seriously handicapped recruits. Wenger came to us several years ago, a victim of a North Dakota blizzard in which he had been frozen so badly that amputation eventually was necessary of both lower limbs and parts of both arms. When we first met him, we were instantly struck by his feeling of optimism and by his confidence in his own ability to work efficiently despite possession of what ordinarily would appear to be an insurmountable handicap. At the start we gave him the most simple tasks, jobs which had to be done, of course, and which would develop his skill in using his appliances. Today he is one of our most efficient workers. Instead of shaving dictaphone records, for example, an

(*Continued on page 216*)

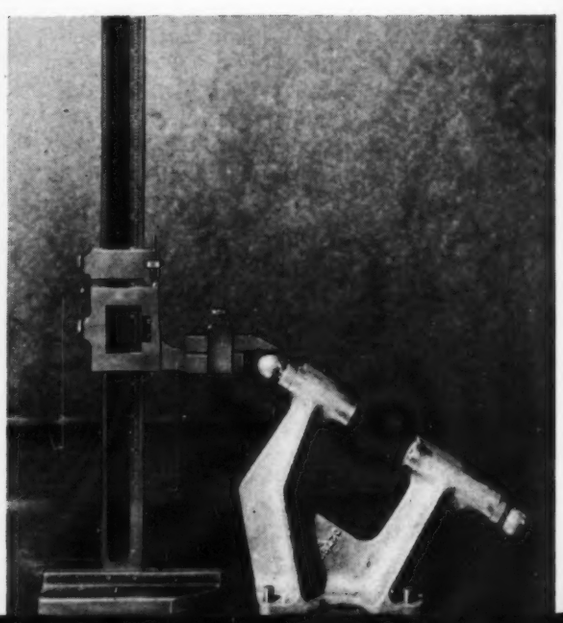
Inspectors in Ten Weeks

DAVID H. FAX, Instructor in Precision Measurements, Research Assistant in Mechanical Engineering, The Johns Hopkins University, Baltimore



The quick-training job is by no means done. War plants still need thousands of workers trained in special skills. To its long series of case studies in training, *Factory* therefore adds this one. Designed to train men for precision inspection in aircraft work, it could with minor changes be adapted to the needs of any other war industry

Above, measuring a dovetail slide—trigonometry applied to inspection. Below, learners are taught (left to right) to check an angle by means of the sine bar, a casting with a vernier height gage, an eyebolt with dial attachment and vernier height gage, a tapered plug with a micrometer



To HELP FILL the pressing need for trained specialists in the rapidly expanding defense industries in the Baltimore area, the School of Engineering of The Johns Hopkins University, under the auspices of the United States Office of Education, has been offering a series of defense training courses since early 1941. Almost all the courses are given in the evening for the benefit of men already employed in industry, and cover subjects such as radio engineering, time and motion study, plastics, aircraft cabin supercharging, and chemistry of powder and explosives. From January 1, 1941, to December, 1942, a total of 5757 men and women were registered in 113 such courses. For an engineering school whose normal undergraduate enrollment is about 320, this represents an achievement of major proportions.

One of the courses which has attracted considerable attention has been that in *aircraft precision inspection*. Designed specifically for men who have had no background in engineering or in industrial work of any kind, the course has nevertheless been maintained on a college level and has been found to fill a long-felt need in the aircraft industry. The purpose of the course is not to train men for routine types of assembly inspection, but to develop inspectors who can handle the more advanced problems that arise in tool inspection. The course runs for ten weeks. During that period there is intensive and full-time instruction, consisting of fifteen hours of lectures and eighteen hours of laboratory work each week in five different subjects.

Organization

One lecture a week in this course is devoted to the subject of *organization* given by a representative of a local aircraft manufacturing company. The students are first given a short history of the aircraft industry and told about its prospects for the future. The organizational set-up of a typical aircraft industry is then explained, and the students are taken on an oral tour through the plant, from the incoming materials, through the various operations, to the subassemblies, and to final assembly and testing.

The next phase of the subject covers the place of the inspection department in the industrial organization, particularly its relationship with the procurement, production, and tooling departments. The requirements of the individual inspector are then emphasized—the need to use diplomacy and tact. The relationship between the inspector and his superiors, and with the shops and production departments, receives particular attention.

Precision Gaging

Four lectures a week and three laboratory periods of three hours each are spent in *precision measurements*. In the laboratory, the student makes use, generally for the first time, of the tools and instruments used in inspection work. The first weeks are spent in developing technique in the use of rules, spring calipers, micrometer calipers, vernier calipers, height gages, and similar precision instruments. A series of tests are performed, including the measurement of tapered plugs, tapered and inclined holes, and dovetail slides, which are designed to develop confidence in the use of precision tools as well as to demonstrate the practical uses of mathematics in inspection problems.

In the latter part of the course more advanced problems are tackled. The use of measuring wires to measure screw threads and pipe threads, the measurement of gear teeth, and the use of the sine bar are covered in detail. Most important, the student takes measurements of actual castings used in aircraft manufacture and learns how to locate holes or surfaces from a "base" or coordinate system. The work in the laboratory is performed in groups of three or four, and here the men are studied for leadership and the ability to cooperate.

Lectures in *precision measurements* parallel the laboratory work. The principles involved in the various tests and the methods of attack are here explained. The student is introduced to the various systems of standards that have been set up, such as standard classes of cylindrical fits, screw-thread systems, and gearing systems. The manufacture of surface plates, accessories, and fixed gages, and the laying out of gage tolerances are discussed. The principles underlying interchangeable manufacture and selective assembly are stressed. In addition to the regular lectures, men from outside industries are invited to speak to the students on problems of manufacture as related to inspection work.

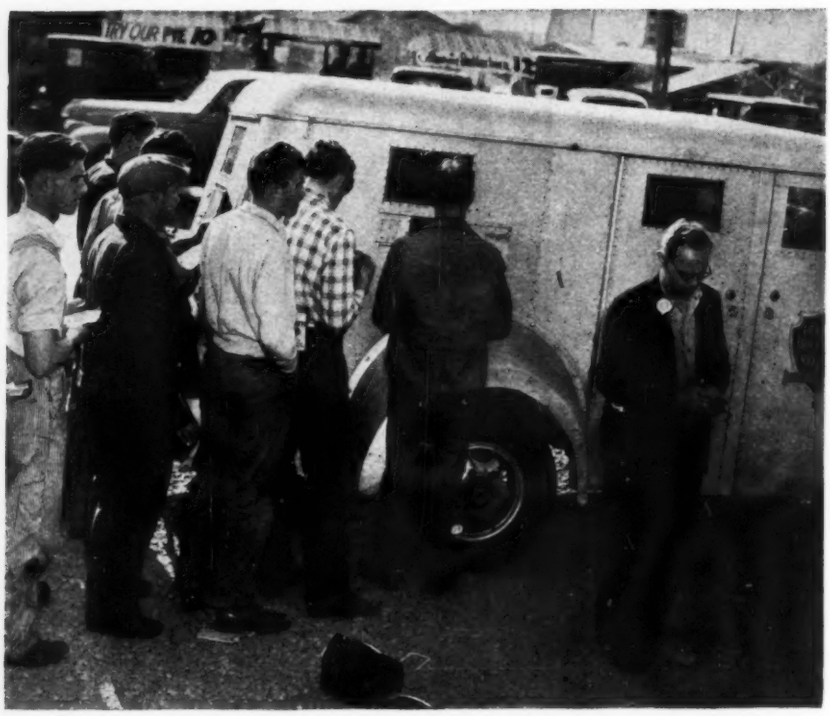
Shop Math

Four hours a week in the classroom are devoted to *shop mathematics and trigonometry*. The course opens with a review of the arithmetical processes with fractions, decimals, and the solution of simple linear equations. Next the student is introduced to the trigonometric functions and the use of trigonometric tables. Considerable time is spent in the solution of right triangles, the use of the coordinate system, and the construction of angles.

(*Continued on page 218*)

MANAGEMENT SHORTS

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary management accomplishments. Accepted articles will be paid for



A boon to the 23,000 employees of the Boeing Aircraft Company, Seattle, now on a new 7-day work schedule instituted by the United States War Department, is at-the-plant banking service. Supplied by a local armored car company at small fees: 10c for checks up to $40, 15c for checks up to $70, and 20c for checks up to $90

Does Drill Speed Affect Drilling Time?

HAROLD R. NISSLEY, Associate Professor, Kent State University, Kent, Ohio

Recently, when I was engaged in some motion and time study work for a war plant, I observed considerable variation in the drilling time in one department.

One example was the time taken by two operators to drill 46 No. 30 (about $\frac{1}{8}$-in.) holes through two thicknesses of 0.03-in. aluminum. One man took 0.88 minute to do this job and the other took 2.40 minutes. The drills used in this department were all of one make and series; the points were all in the same condition. One man, though, went through the metal as if he were drilling butter; the other as if he were drilling steel.

Despite the similarity in drills, I decided to check the r.p.m. of eleven in the department. I found the speeds varied from 1900 to 4500—the average speed being 3600 r.p.m. All nameplate data were given except the r.p.m.

"This is the answer," I thought. But before leaving the department, a check was made on one more drill—the one used by the fastest operator. Many drill speed ideas went tumbling when it was found the speed of his drill was 2100 r.p.m.—the second slowest drill in the entire department.

A closer study revealed this operator was really "leaning" on his drill, whereas most of the others were letting the drill and drill point do the cutting. And this operator used no more drill points per 10,000 holes than the others.

In this as well as in other types of machine and human phenomena it is hazardous to generalize without more data under controlled conditions. But it would seem that the normal or perpendicular force is of such importance as to overshadow speed completely. In other words a 10 lb. force applied to a drill making 2000 r.p.m. will result in quicker drilling time than a 2 lb. force applied to a drill making 5000 r.p.m. Putting it another way: The applied effort of the operator is more important than the drilling speed of the tool.

To get this higher normal force *easily*, both hands and arm muscles should be used. Where possible the shoulder, body, and even leg muscles should be brought into play by putting the work or the tool in a position to allow these muscles the greatest opportunity to serve the operator. Benches, jigs, fixtures, and other workplaces that are too high or too low, too far away or too close to the operator, defeat this purpose and result in fatigue and low productivity. Indeed, so many benches and fixtures are made by men who are unaware of these fundamental laws of motion that management should start the industrial engineering of a job *before* the jigs and fixtures are made not after it is too late to correct these errors.

War-Winning Ideas

Selected suggestions from war workers. Each of the following has been awarded a WPB Certificate of Individual Production Merit or has received honorable mention from the War Production Board:

Suggestion No. 1

Change in aircraft engine assembly methods saves time and tools.

Made by Peter Cojei, assistant foreman, Aircraft Engine Division, Packard Motor Car Company, Detroit.

Previously, in the assemblies of wheelcase, gearcase, and supercharger, fourteen men worked individually, requiring a complete set of special tools per man.

Suggester changed the routine to divide complete assembly into progressive steps, two men being assigned to each step and one utility man for the complete job. Under the previous method fourteen men averaged nine complete assemblies per shift. Now nine men average fourteen complete assemblies per shift. In addition, tool requirements are reduced from fourteen sets to two.

Suggestion No. 2

Senior employees help foreman train new workers.

(*Continued on page 222*)

MAINTENANCE SERVICES

SELECTION • INSTALLATION • INSPECTION • UPKEEP • ORGANIZATION

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MAINTENANCE as the Editors See It

Color Coding Will Simplify Use of Lubricants

A COLOR CODE for lubricants is something that is needed and will be available in due time from the American Standards Association. This organization has been requested by the War Production Board and the National Machine Tool Builders Association to undertake the formulation of such a code.

Its purpose will be to indicate by color the grease or oil to be used on a machine or parts thereof in order to prevent costly mistakes in the application of lubricants by the operator or oiler. It is intended that these standard color markings will be applied both to the machine part and to the container holding the proper lubricant for that part.

Instances are known where machine tools and other equipment have been damaged through use of the wrong lubricant because of lack of proper identification. Probably there are many such instances that have not come to light.

Use of a color code for lubricants is not new. Probably a good many plants have worked out a more or less satisfactory code for their own use. There will be, nevertheless, distinct advantages to a standard code that covers all industrial requirements.

Pending issuance of the proposed code, it will be very much in order for plants that have to let inexperienced help handle lubrication to develop some satisfactory means of preventing mistakes in the application of the lubricants used.

You Will Have to Select Motor Sizes More Carefully

OVERMOTORING is out for the duration, by official action. In normal times there is something to be said for the universal practice of selecting motor ratings that will leave a safe margin for peaks and future increases in loads. Longer life, lower maintenance costs, and less trouble in general are the advantages commonly sought by playing safe and applying a motor that is too large rather than too small. It must be admitted, nevertheless, that this practice has often been carried too far.

Copper, iron, and manpower are now too scarce to permit them to be tied up in motors or any other equipment that is larger than needed for the job in hand. Hence, according to a provision in general conservation order L-221, recently adopted by the War Production Board, the purchaser of a motor must show that the horsepower is not greater than is actually required.

The proper size of motor for any application can usually be determined without difficulty and with sufficient accuracy for all practical purposes. Many plant men have always done this as a routine matter. Those who have not been accustomed to doing it will have to do it now.

Closer motoring will no doubt result in more instances of at least occasional overloading and overheating. Many motors will require more careful watching. Continuous overheating may be expected to shorten their life. That, too, is unfortunate but cannot be helped.

The same order also restricts the use of special types of motors to the conditions and purposes for which they are required. If the use of an open-type motor is practicable, it will have to be put in despite the fact that an inclosed type might be less troublesome.

These necessary restrictions obviously will tend to put additional burdens on the maintenance department but it must and will take them in its stride, just as it always does.

No Limitations on Resourcefulness and Ingenuity

MAINTENANCE CAN LOOK BACK with satisfaction upon a hard job that has been excellently done in most plants during the past year. It can look forward to a year in which still greater demands will be made.

It is no military secret that production of many kinds of war matériel will be radically stepped up. Continuity of operation will be more essential than heretofore. It is to be expected that many maintenance departments will lose valuable men to the armed forces. They will be difficult to replace. New men will have to be trained until they know the plant and are competent to execute assignments on their own.

New equipment, parts, and supplies will be just as difficult to obtain as now. Conceivably more so. In many plants the equipment will need more careful watching and is likely to give more, rather than less, trouble. During the past year, hard crowding and long hours of operation have taken a good deal out of all kinds of equipment, particularly that which has been in service for some time.

Conditions have imposed many limitations that make life harder for maintenance men. Washington has had to impose others. More may come. But there are not, and will not be, any limitations on resourcefulness, ingenuity, or the determination to do the best possible job under the circumstances. Maintenance cannot be deprived of these priceless tools. It will have to manage somehow to use them even more effectively this year.

Welding is widely used in repairing broken equipment. Here the sparks fly as two welders set to work on a large cylinder that developed a bad crack. Cylinder was mounted on rollers, to permit turning

Our Maintenance Is Geared to Wartimes

Proper organization is essential when wartime demands for production require 24-hour operation, 7 days a week, and maintenance must be done on the run

W. S. REARICK, Chief Works Engineer, ———— Works, Aluminum Company of America

KEEPING BUILDINGS and equipment at one of our major works in good operating condition is a full-time job for more than 600 maintenance workers, most of whom are highly skilled toolmakers, machinists, electricians, welders, pipefitters, millwrights, carpenters, and painters. These men keep in condition an industrial establishment of more than 100 buildings.

The equipment in these buildings consumes in excess of 60,000,000 kilowatt-hours of electrical energy annually. The nature of the work performed requires 53 traveling cranes ranging from 2 to 50 tons capacity.

Maintenance work is under the administration of the engineering division, headed by the chief works engineer. The organization of the maintenance departments of the engineering division is shown in the chart on page 124. The chief engineer, with his assistant, supervises the two main maintenance departments which are Equipment Maintenance and Construction and Buildings and Grounds Maintenance and Construction.

The first department, under the master mechanic, is responsible for the maintenance of all mechanical and electrical equipment. Because of the extent of the works—more

than 1 mile in length—it has been found more efficient to have two mechanical and electrical maintenance centers rather than one. The north half is designated as Plant A. It is served by a mechanical and electrical maintenance group of approximately 200 men located there. The south half of the works may be designated Plant B.

Approximately 225 mechanical and electrical maintenance employees are required for this part of the works. Two mechanical and electrical maintenance centers can give more immediate and detailed attention to the work in each area than could be rendered by one. Although duplicate trade groups are employed at each plant, flexibility is maintained by almost daily shifting of men from one plant to the other in order to take care of changing amounts of maintenance work and to concentrate the maximum amount of help where major breakdowns occur.

In this way loss of production is reduced to a minimum.

In addition certain specialists are maintained at one plant or the other who supervise certain equipment regardless of where it may be located. By specializing in certain types of equipment, these men become highly skilled in their fields. For example, one man specializes only in office equipment, such as typewriters, time clocks, and adding machines. Another man specializes in elevator inspection and maintenance, and is in charge of all elevator operators. Still another specializes in scale inspection and maintenance. He inspects all scales in the company twice annually and in so doing makes two nation-wide tours, each of which requires from 5 to 6 weeks, of all the Aluminum Company of America plants.

Two Electrical Groups

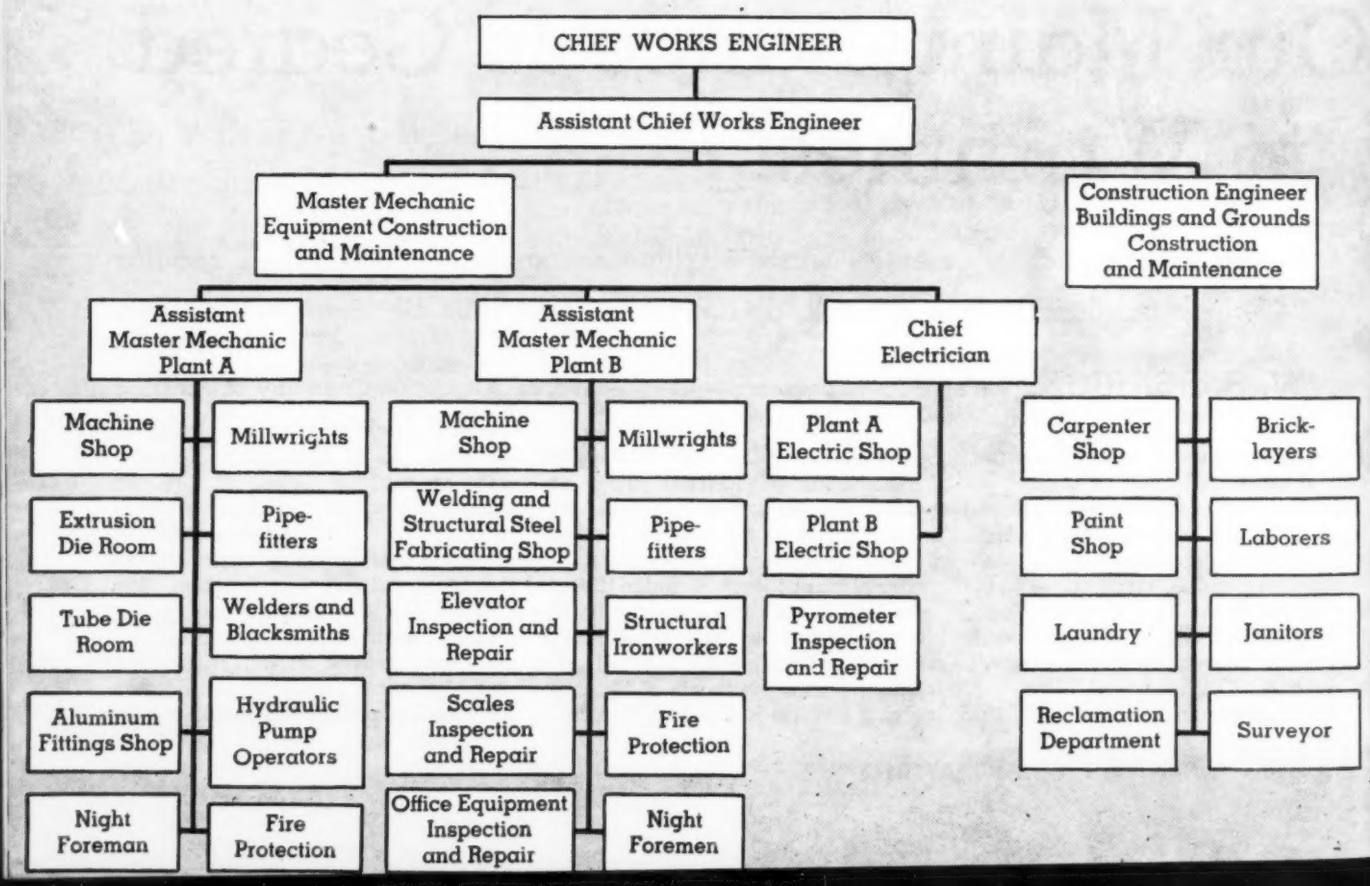
Electrical maintenance and construction follow the same pattern as the mechanical set-up in that two electrical shops are maintained. One is in Plant A while the main shop is in Plant B. Here again there is a specialized group of four men whose duties are the checking, calibration, and repair of all pyrometric equipment used in connection with remelting, annealing, and heat-treating furnaces. Electrical maintenance and construction work is under the supervision of the master mechanic along with mechanical maintenance and construction work, since the functions of these two different maintenance groups are so interrelated with respect to equipment that they must necessarily work very closely together.

The Buildings and Grounds Maintenance and Construction Department, under the direction of the construction engineer, comprises an organization of nearly 200 men whose responsibility is the maintenance of all works buildings, grounds, and facilities other than mechanical and electrical equipment.

Most of the men in this group are skilled tradesmen, such as carpenters, bricklayers, and painters. In addition to maintenance work this construction group has expanded at times to take care of all the construction. In fact, every building in this works was built by this department. In addition a considerable part of the works' aluminum fabricating equipment, much of it of a very special nature, was designed by its own engineering division and constructed in its mechanical and electrical shops.

During all normal periods of operation, much emphasis is placed on preventive maintenance, rather than on making repairs after trouble and breakdowns have occurred. Preventive maintenance requires careful and regular inspection of such equipment as electric motors, elevators, and cranes. The inspector is always a qualified maintenance man on that particular type of equipment. His standing in-

MAINTENANCE DEPARTMENT ORGANIZATION



Repair and reconditioning jobs on equipment are never too big to be handled efficiently in the maintenance and construction machine shop. Machines and parts for other Alcoa plants are made here

structions are to see that maintenance and repair work is done at the time the inspection shows need for it. This means that the inspector is also the fixer; hence there is little need for anyone to make out lengthy, detailed inspection reports.

In other words, the policy of our maintenance inspection work here is to go easy on paper records and long on actually doing whatever work inspection shows to be necessary.

Fire protection is another important responsibility of the master mechanic and his mechanical maintenance organization. Again, inspection is an important function in making sure that all firefighting equipment in the plant is in condition to operate with full effectiveness whenever it may be needed.

All fire extinguishers, hose houses, and equipment are inspected daily. Fire pumps and hose are tested under actual conditions at frequent and regular intervals. This inspection work makes a full-time job for one man at each of the two plants.

Firefighting personnel is organized on a rather informal, but by no means inefficient, basis. More than one-third of all employees at this works have received personal instruction and demonstrations in the use of fire extinguishers and other firefighting equipment. No matter where a fire might start in the works, some of these employees are always in the immediate vicinity. They know how to use fire extinguishers, and do use them immediately whenever a fire is discovered. A group of trained firemen is available, however, at each of the two maintenance shops. They are dispatched to the scene of the fire and direct the firefighting if the blaze should get beyond control of the men in the immediate vicinity.

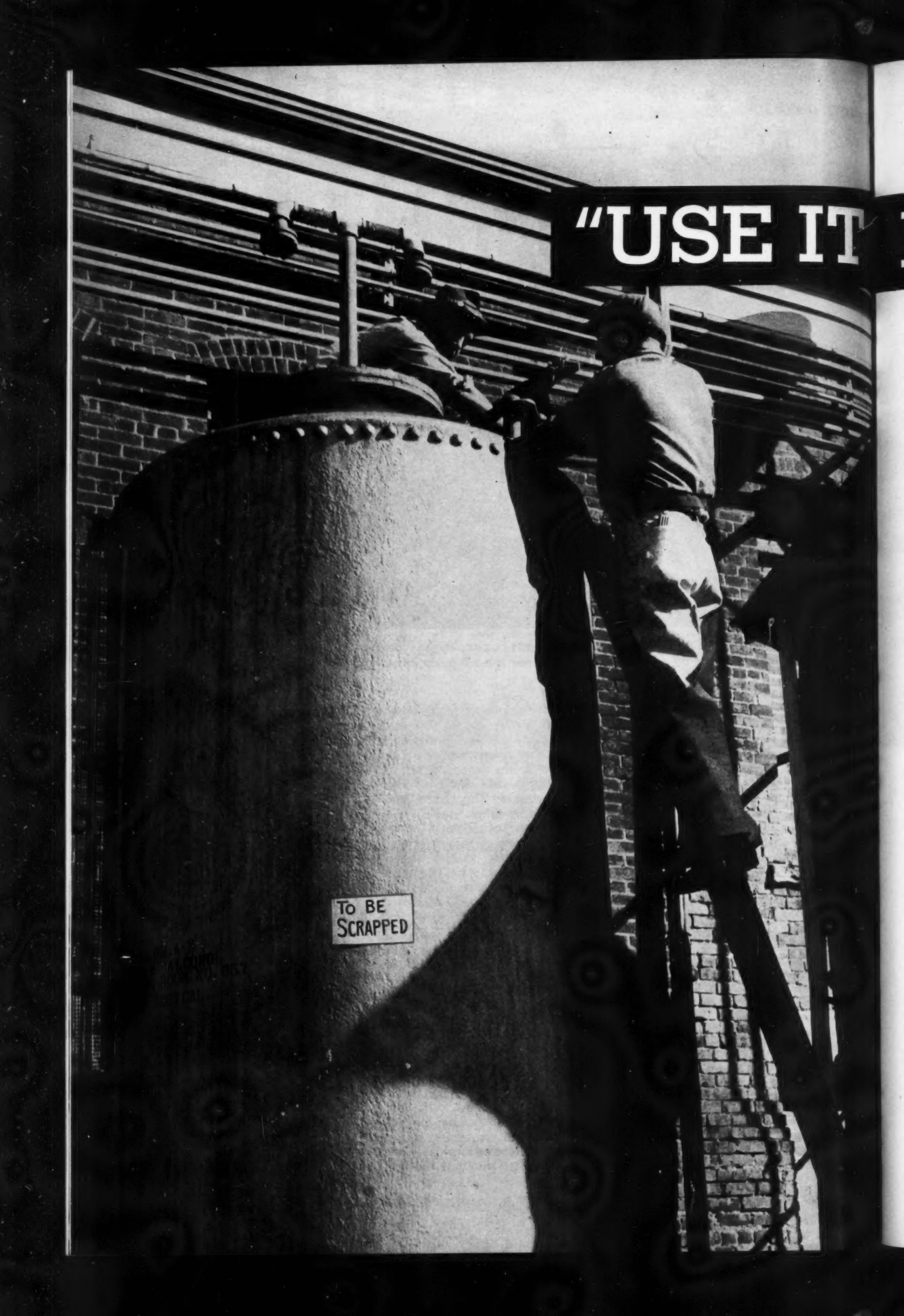
When a Fire Occurs

When a fire is discovered a call is immediately sent to either of these maintenance shops, and this crew of trained firemen immediately leaves for the scene. The importance of having a large group of employees everywhere in the works instructed in the use of fire extinguishers is shown by the fire record of this works for the past year. In no instance has any aid been required to extinguish a fire other than that rendered by employees in the immediate vicinity of the fire.

Its maintenance organization makes this works almost self-sufficient in the task of keeping its buildings, grounds, and equipment in satisfactory operating condition. True, some jobs of a special nature are delegated to outside shops, but they are very much in the minority.

In addition to the maintenance organization just described, there are available from the engineering division experienced engineers in each production division who work in an advisory capacity with the maintenance shops on major repair and maintenance jobs. In many cases these engineers redesign equipment parts and change operations where chronic cases of maintenance trouble occur. Every two weeks the chief engineer meets with these division engineers and the top mechanical and electrical supervisors to discuss major maintenance problems and take appropriate action.

The master mechanic and his assistants, also construction engineer, hold regular meetings with their foremen for the same purpose. Thus the division engineers and maintenance supervisors compare notes and benefit from one another's experience with similar problems in other divisions.


"USE IT
TO BE
SCRAPPED

CONSERVE MATERIALS—THEY WILL WIN THE WAR

T NOW—or Scrap It"

This is the order of the day at duPont—an order that releases for the war effort all useful metal. Usable parts and equipment are quickly repaired and put back into service. Metal without an immediate use is collected as scrap and sold

CLARENCE SNYDER, E. I. duPont de Nemours & Company

RECLAMATION of all usable material and releasing for the war effort every pound of metal that is not immediately needed, have been worked out to a featheredge at one of the Eastern plants of E. I. duPont de Nemours & Company.

At this plant changes in processes and products take place frequently. A considerable amount of the equipment and piping is made of aluminum, copper, monel metal, brass, and other comparatively expensive materials. Methods suitable under a peacetime economy for handling such materials have, of course, long been in effect.

With our entry into the war it was realized that the demand for all common metals and alloys would grow apace and that every effort must soon be made to get all scrap back to the mills. Accordingly a detailed reclamation program was worked out and put into effect early this year. The objects of this program are twofold:

1. To reclaim promptly all usable equipment and parts taken out of service for any reason.

2. To release as scrap all metal parts and equipment that are not immediately essential to operation.

The purpose and importance of the reclamation program were explained to members of the labor-management committee, as well as to foremen, supervisors, and other key employees, and their cooperation was sought in reporting all unused equipment and metal. Shortly after the program was initiated, the entire plant was carefully gone over and every piece of equipment and part was examined to see whether it could be spared. Spare-parts storerooms were given the same scrutiny and all parts that could be spared without jeopardizing operations were promptly junked and sold. So much scrap was uncovered that a second plant-wide hunt will shortly be made.

Every employee is invited to report anything he thinks ought to be scrapped.

All reports are sent to the head of the salvage department for investigation and action. The production and engineering departments are consulted when it is necessary to determine whether certain equipment should be disposed of or kept. Handling the matter in this way minimizes the danger that needed equipment will be released or scrapped. However, the emphasis is on scrapping or releasing, rather than holding indefinitely for possible use in the future.

A Simple Routine

The routine that has been set up for separating salvageable material from scrap is simple but highly effective. When the decision has been reached that a certain piece of equipment is no longer needed, a tag bearing the words "To Be Scrapped" is affixed to it. As soon as possible the piece is dismantled and all piping removed, unless similar equipment is to be erected in its place.

The piece is then carefully examined to determine its condition. Large pieces are likely to be examined on the spot, to save unnecessary handling, but everything else is sent to the salvage department. If the item is in good condition, or can be restored, it will be sent to the spare-machinery or to the superfluous-machinery yard.

Spare machinery comprises equipment which it is felt should be kept for later use. *Superfluous* machinery consists of items for which the plant no longer has need. Lists of such items are sent to other duPont plants, and those that are not needed are placed on the market.

When a piece of equipment is scrapped, it is completely dismantled and the parts comprising it are salvaged or segregated according to composition – brass, copper, aluminum, etc.—and sold as scrap.

In view of the difficulty of obtaining new equipment and the strong desire to lessen as much as possible the demands on equipment manufacturers, every effort is made to salvage everything that can be put into usable condition.

All piping, valves, fittings, and other items are carefully inspected. Pipe is cleaned, and bad spots are cut out. The remaining lengths are straightened if necessary and stored in racks to await withdrawal by the pipefitters and plumbers.

Valves are disassembled, and the condition of each part is noted. If reconditioning is possible, needed repairs are made, such as reseating, insertion of new parts secured from the manufacturer, or chasing defective threads. Reconditioned valves also are put in used stock until needed.

Valves, fittings, or other parts that cannot be restored to usable condition are scrapped and disposed of at once through regular channels.

The amount of material that flows daily to the salvage department is large. It comprises about everything to be found in a good-sized plant, from discarded or broken machines to worn-out clocks. From this department comes a stream of reconditioned items ready for service again, and many tons of scrap iron, copper, brass, rubber, and other materials badly needed for the war effort.

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1

How duPont Inspects and Reclaims

3

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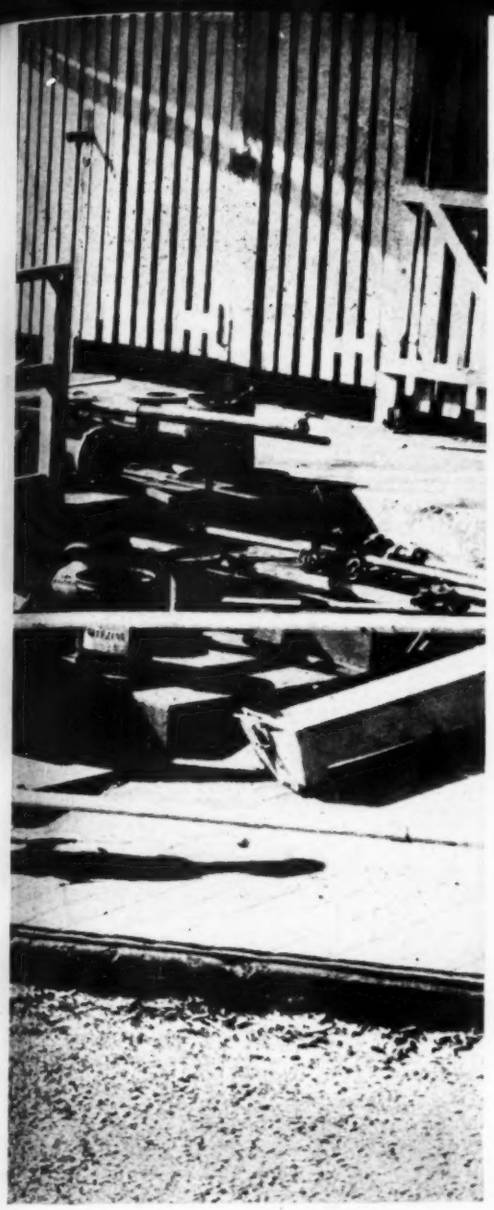

Pipefittings

1 All dismantled equipment that is not too large to be handled conveniently is taken by truck to the salvage department for inspection. Picture shows a load of pipe to be reclaimed

2 Valves and fittings are removed and put aside for careful examination to determine whether they can be reconditioned. The salvage expert inspects all parts, decides what can be used

3 Valves that need reseating to make them usable again are sent to one of the pipe shops, which are equipped to handle this work

4 After repairs have been made the valve is returned to the salvage department, where the expert gives it a final check, just to make sure

5 As good as new, the valve is put in the storage rack to await another call to service It will save the man-hours and materials that would otherwise be required to make a new one

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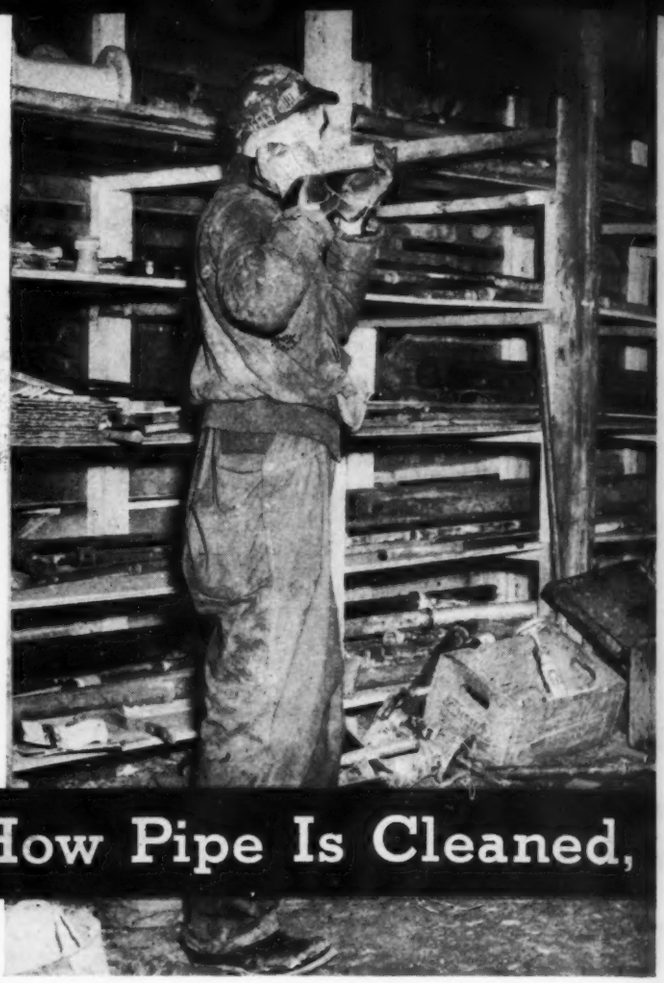
Use It Now—or Scrap It" *(concluded)*



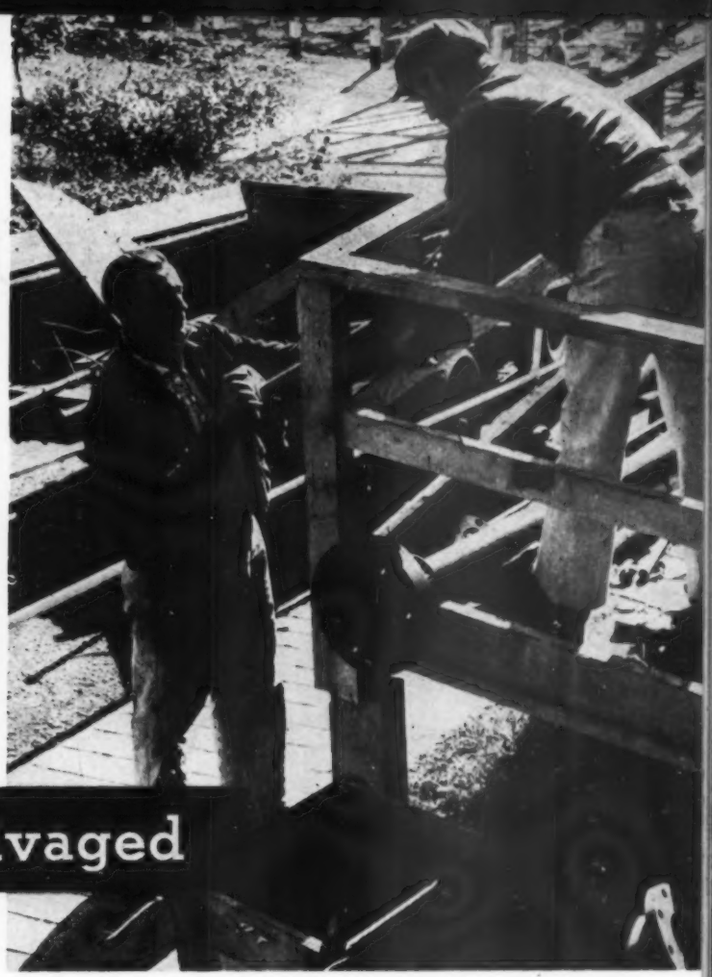
How Pipe Is Cleaned,

1 Pipe removed from service is checked. Straight pieces can be re-used. Left, the scrap pile

2 All pipe that can be used again is cleaned if necessary and stored in the salvage department

Superfluous Equipment

Equipment that is in good condition, but no longer needed, is stored, awaiting sale to some other plant



Straightened, and Salvaged

3 Salvaged pipe is threaded in a pipe shop, after it has been drawn from stock and cut to length

4 Another load of scrap culled out by the salvage department starts on its way to the scrap yard

Scrap for the Furnace

Here, on a salvage dealer's truck, a load of scrap starts on its final journey, to the steel mill for reclamation

What to Do When Floors Leak

Here are details of several methods that can be used to stop passage of water through new or old floors subjected to conditions for which they were not designed

F. W. DANIELS, Chief Engineer,
The H. K. Ferguson Company, Cleveland

MANY PLANT ENGINEERS are having trouble with floors that leak. This situation is due in considerable degree to the large number of conversions that have been made. As production increases the need for additional floor space increases, and of necessity some temporary, makeshift arrangements must be made. The result is that buildings and certain portions of buildings are being used for purposes for which they were never intended, and which were not taken into account in their design. If a wet process is involved, trouble soon shows up.

There are a number of methods of waterproofing existing floors; some of these methods are costly and some inexpensive. If the floor is in good condition and is to be used for light traffic, it may be coated with various patented compounds that may be applied either by spray or by brush. Any heavy traffic, however, may soon render this kind of treatment ineffective. As a result protective coverings are usually found necessary when such repairs have to be made.

Before describing other methods it will be in order to say that waterproofing, generally speaking, is a broad term that is often misapplied, misunderstood, and misused in its relationship to the design and construction of industrial buildings.

This situation comes about for two fundamental reasons. First, the term waterproof is usually used when dampproof is the proper word. Second, floors often thought to be waterproof have really been made water-resistant rather than waterproof.

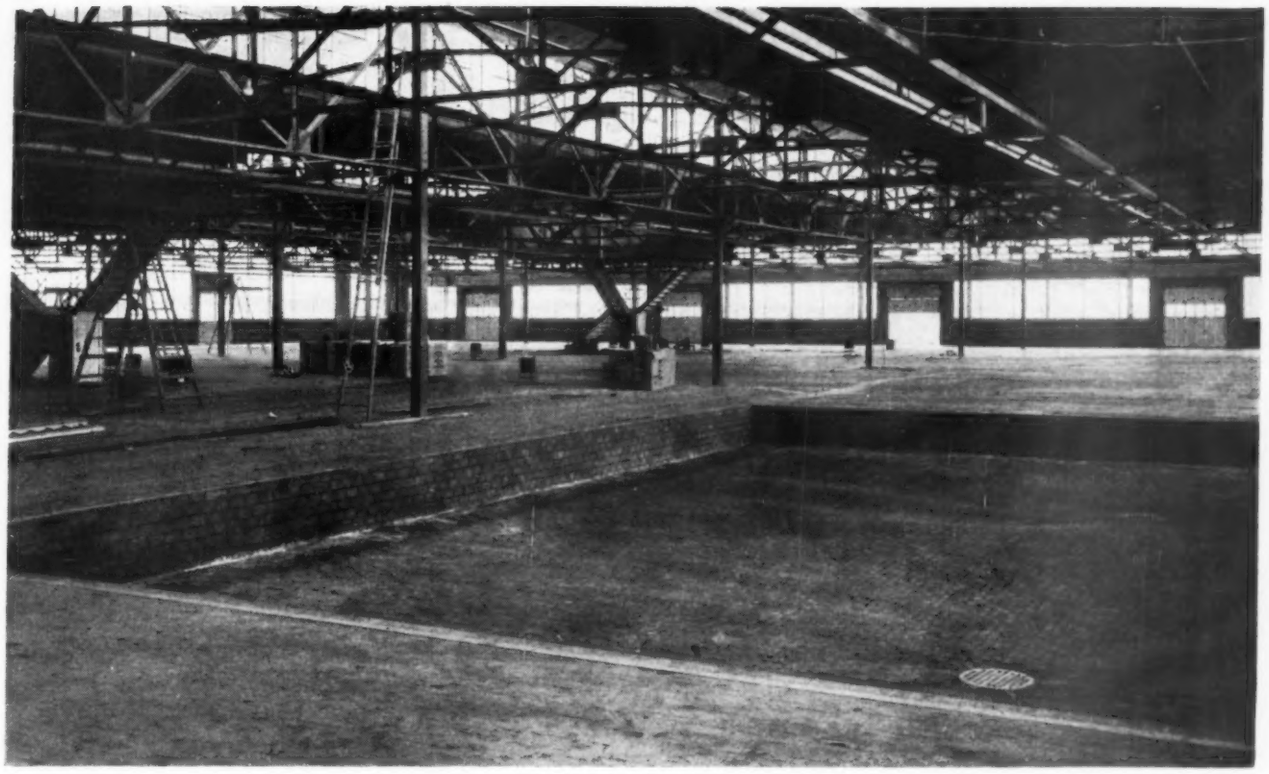
Good Floors Damp-proof

Waterproofing should be thought of only when there is actual infiltration of water due to pressure from surface seepage, and the presence of water in volume which sets up hydrostatic pressure. All other examples of water protection come under the heading of damp-proofing, which is the protection against moisture when actual pressure is not encountered.

On the other hand, floors that are usually regarded as having been waterproofed have had no actual treatment of that kind, but have been designed and built especially for the function to be performed atop them. None of the many patented waterproofing compounds and methods has been used on them; instead, they have been designed and laid in accordance with the best of engineering and building practices.

This statement is true of most of the industrial buildings constructed today. There are, of course, exceptions when wet processes are to be used in the building, and also when the building is located in an extremely moist locality. In the majority of instances, however, the matter of waterproofing has been solved in the original design of the building itself.

A typical example of this practice may be found in a building constructed for the processing, preparation, and packaging of various foodstuffs. In processing of this kind the problem of food acids spilling onto the floor is of major importance because over a period of time they can be extremely destructive to concrete. The floor therefore was made of wood and constructed on the same principles as a boat. This same type of floor was also constructed for the second story, and there have been no reports of water seeping down below, notwithstanding the fact that the floor is kept damp most of the



A well-constructed floor that is provided with a sufficient number of drains to carry all water away promptly and thus prevent the formation of puddles, is not likely to give trouble from leakage

time to prevent it from drying out and possibly developing cracks through shrinkage.

Likewise, there are plenty of examples of wet processes being conducted on second-story floors. In this instance the floors are usually provided with sufficient drains to carry the water away without leaving puddles that might eventually manage to seep through the concrete.

If there will be times when large quantities of water will remain on the floor for any length of time, some precautions to make the floor waterproof must be taken into consideration when the floor of the building is being designed.

Concrete Resists Water

Technically speaking, concrete—which is used in most industrial buildings either as a subfloor or as the floor itself—is what is known as a water-resistant material.

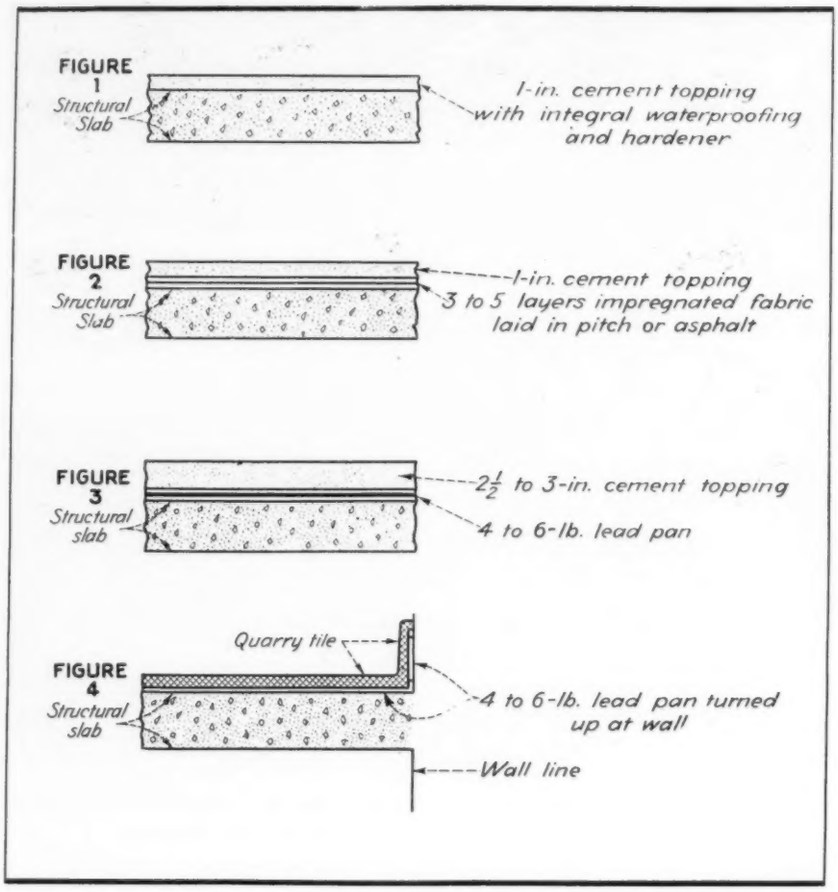
The fact that water does penetrate through concrete floors and walls is due to minute passageways that are formed in the concrete for one reason or another. Pinholes and so-called pores in concrete usually result from occluded air. Water voids come from excess water in the mix. Shrinkage cracks result from too rapid drying, while other cracks may be the result of atmospheric changes. It is because of these passageways which allow seepage that concrete floors must have special treatment to make them either waterproof or dampproof.

Therefore, the first step to be taken toward obtaining floors that are water-resistant involves the original concrete mix and pour. Leading authorities insist that concrete can be made practically impervious to water under moderate pressure.

Where watertight concrete is a desirable feature, a few basic principles must be followed. To the average construction man these are simple, everyday precautions, but they are important and they cannot be side-stepped

THESE METHODS STOP LEAKS

1. **Provide adequate drainage**
2. **Lay new concrete floor properly**
3. **Use thick sand or gravel fill under concrete floors laid on the ground**
4. **Add waterproofing material to the concrete mix**
5. **Spray a finely ground iron preparation on the floor**
6. **Pour the finished floor over a metal pan or impregnated fabric membrane**



Figures 1 to 4. Here are three good methods of waterproofing floors

or ignored if a watertight structure is to be obtained. Briefly, these principles are fundamental:

1. Use of good, sound aggregates, properly graded.

2. Use of a carefully controlled amount of mixing water.

3. Accurate measurement of materials and correct proportioning to produce a plastic and workable concrete.

4. Proper placing in forms.

5. Location and treatment of construction joints.

6. Adequate curing.

There is a growing tendency among leading builders today to follow these simple principles in ordinary industrial construction, in order to obtain watertight floors. This is especially true if watertight floors are needed over a small area, where a great deal of attention and supervision can be exercised over a given pour. There are many instances, however, where the conditions of service make special waterproofing treatment necessary.

Such waterproofing treatment is necessary for one of two reasons—water will seep either from the top of the floor to the bottom, or it will be forced from the bottom to the top. One is just as important as the other, and both very often pose a big problem to engineers charged with designing new industrial facilities.

An instance of water forcing itself upward is usually encountered when floors are poured on the ground, making direct contact with moisture in the earth. The trouble is, of course, aggravated in wet weather. One good solution to this problem has nothing to do with the actual floor, but it is very effective. It involves the use of 12 to 18 inches of gravel or sand fill under the floor which may absorb any normal amount of moisture that would otherwise have a tendency to come up through the concrete.

Waterproofing Methods

There are three principal methods for waterproofing new floors for ordinary industrial purposes. They are known respectively as the integral, the metallic, and the membrane method.

As its name denotes, the integral method, shown in Figure 1, is one that makes the waterproofing a part of the concrete. There are any number of patented preparations in liquid, paste, or powder form that are designed to be added to the concrete mix. There are also types of waterproofing materials that are spread onto the surface of the floor after it has been poured. Many of these preparations are accepted in standard practice. As a typical illustration of the use of this method, the floor slab 5 or 6 inches thick is poured without any waterproofing; then a 1- or 2-in. finished cement coating is added which has included in it the waterproofing material and usually a cement hardener.

The metallic method is also often used. It consists of spraying a finely ground iron preparation onto the floor. When this material oxidizes, it expands and seals the cracks and minute passageways in the floor. Exponents of this treatment claim that a floor to which it has been properly applied is well able to withstand considerable water pressure.

Also Good for Old Floors

The membrane method, Figure 2, involves the application of a protected bituminous covering over the surface to be waterproofed. Usually this covering consists of from three to five layers of some fabric such as asphalted or tarred felt, burlap, or treated canvas, laid in either hot pitch or asphalt mastic that has been spread on top of the subfloor to serve as a sealing agent. The finished floor is then poured on top of this membrane. Here again there are a number of products that are acceptable to the trade.

Still another method of waterproofing, and one of the most successful, consists in the use of a lead pan placed either over or under the floor, depending on whether it is desired to have the workers walk on lead or on concrete. It is shown in Figures 3 and 4. Costlier than most of the other treatments, this method is used in the main where wet manufacturing processes are confined to small areas. Lead is not generally available now, but there are a number of protected metals that can be used as effective substitutes. An everyday example of their application is afforded in the average second-story shower bath room.

The three principal methods of waterproofing described previously are also applied to existing floors. All of these methods require at least a 1-in. topping. When the work is properly done the resultant floor is often as good as a new one. For ordinary purposes, one method is usually as satisfactory as the other.

How to Apply Capacitors

Capacitors can put new life into distribution systems and equipment that are bogged down by low power factor, and cut the power bill besides. Here are do's and don't's that will simplify selection and reduce misapplications

C. V. FIELDS, Capacitor Engineer, Westinghouse Electric & Manufacturing Co., E. Pittsburgh

SELECTION OF CAPACITORS is simple once each of the controlling factors has been considered in the light of system conditions and expected benefits. The relatively few cases of misapplication mark capacitors as one of the easiest kinds of electrical equipment to select and apply.

Selection of capacitors must be preceded by seeking the answers to the following questions:

1. What is the nature of the power rate structure? In what way does reactive kva. or power factor enter into the final bill?

2. What voltages, currents, and power factors exist on plant feeders during various normal load conditions?

3. Does it appear that these load conditions may be exceeding the distribution circuit and transformer ratings?

Check the motoring of all loads while making a capacitor survey. Underloaded, low-speed induction motors are one of the most prolific sources of lagging current. On the other hand, a synchronous motor can often be used to advantage in correcting low power factor.

If the capacitor is being added to reduce the cost of purchased power, the rate study will probably show that the power factor is determined in one of the following ways:

1. Power factor measured during peak demand period. Using maximum kva. demand has the same effect.

2. An instantaneous measurement of power factor may be made during normal load conditions, or the average of several such readings may be taken.

3. An integrated power factor may be computed from the cumulative readings of the kilowatt-hour and reactive-volt-ampere hour meters.

4. The power factor is often measured only on highly inductive loads such as neon signs, welders, and induction motors, and a corrected value is used in making up the flat charge for connected load or kw. demand. Here only the offending load need be corrected.

The exact method of measuring power factor must be known, since a capacitor that will give unity power factor when the third method of calculation is used, will probably be insufficient to give unity power factor under average or peak load.

It is important to know exactly how the measured power factor is taken into account for billing. For example, the power factor may be:

1. Applied to energy charge only.

2. Used to set a billing demand for block demand rates.

3. Used to establish a flat demand charge to be added to the cost of energy.

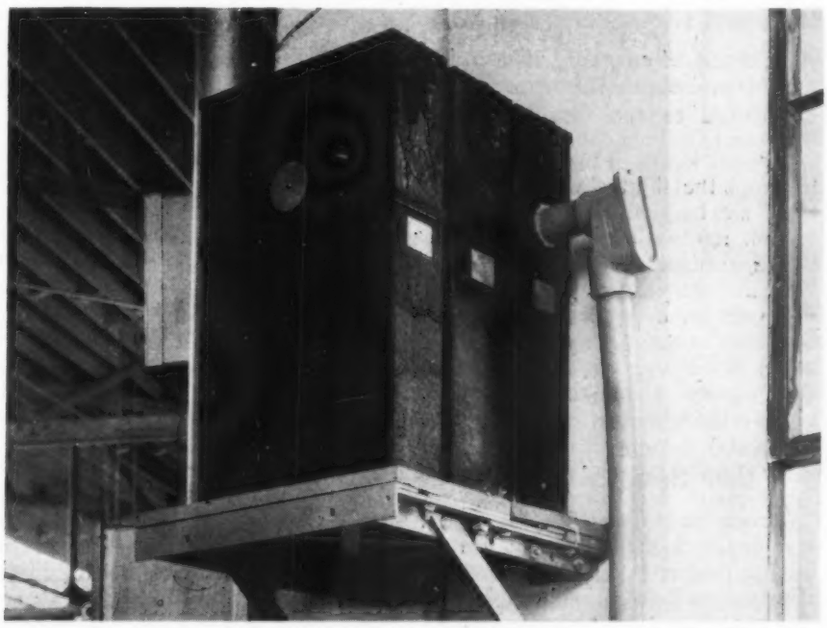
4. Used to set a discount on the net bill for power service.

Although few rules can be given for arriving at the optimum size of a capacitor bank, due consideration of the above factors will usually lead to a direct quantitative solution.

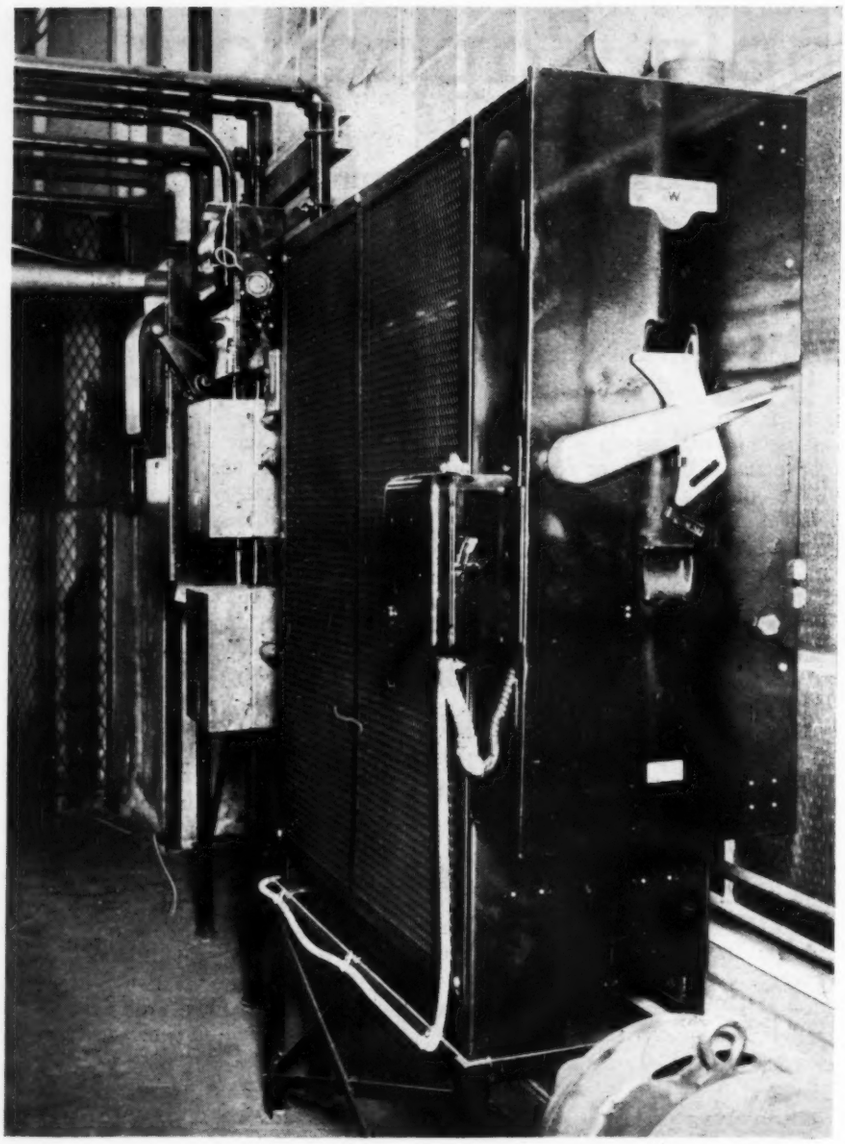
The location and size of the individual banks making up the total installation will depend upon plant layout and operating conditions. Perhaps the most likely arrangement will be apparent by inspection, but the decision should be checked in the light of the following considerations:

A single large bank is preferable in a plant in which power cost saving is of prime importance. The greatest benefit will be shown if the loads fluctuate widely on branch circuits that are of low voltage, and possibly are located where there is no available space for capacitors.

The low line reactance in series with a large bank at the service entrance may require large switches to



Capacitors installed on power lines serve to reduce or eliminate non-working (wattless) current, make room for more working current



This is one of several 180-kva. banks of 575-volt capacitors in a textile machinery plant. They are installed at end of main feeder cables, are connected to the distribution bus through an air circuit breaker

interrupt the short circuit current. If there are harmonic voltages on the system, reactors may have to be installed to reduce them.

If the secondary voltage is under 460 volts, or if power is metered on the transformer primary, it will be better to connect the single bank on the primary, unless the transformer needs relief from the reactive current.

Use Several Banks

It may be desirable to use several medium-sized banks if they can be put on feeders having a more or less constant total load, and if the bank size and voltage are economical values. Capacitors rated less than 15 kva. and 460 volts cost more per kva., although the use of banks rated 5 kva. and 230 volts frequently proves advantageous.

Individual load correction is best if the devices drawing reactive current operate fairly steadily and are large enough to require an economical size of capacitor without making the net power factor of the combination excessively leading. That is, when individual correction is used the capacitors are connected to the terminals of the load so that the motor and capacitors will be switched off simultaneously. This arrangement precludes the necessity for other means for cutting the capacitors off during light loads.

If, however, there are several smaller low power factor loads nearby there is a temptation to lump correction at the terminals of the largest motor. If there is more than sufficient correction for unity power factor at no load, induction generator action may cause overvoltages to be built up while this motor is coasting to a stop.

The saving in the cost of switches will perhaps more than offset the increased cost of using smaller capacitors. It is always conservative and proper to place unit or small group capacitors at the terminals of an offending load or along an overloaded feeder when you are in doubt or have insufficient time to make a thorough analysis. Although several benefits may be expected, a capacitor that is selected and located so as to cancel the reactive current at its origin must give all the desired benefits. Permitting either leading or lagging reactive current is a compromise and fully effective only in the improvement of the entire system power factor.

Recently developed capacitor inclosures and mountings make it possible to squeeze in units near the load in the most crowded factory provided excess heat, dirt, or other condition does not prohibit such installations.

No Mounting Problems

Suitable provisions make it possible for these assemblies to be mounted on the floor or wall, or even to be suspended from the ceiling. When floor space is not at a premium and dirt is no factor, medium to large indoor racks are usually floor-mounted. Like the dust-tight units, these have individual fuses and are often supplied with coordinated breakers. Some installations use a weather-resisting outdoor bank completely equipped and wired, including current transformers to trip the oil breaker.

When you install capacitors, keep these "don't's" prominently in mind:

1. Don't install capacitors in excessively hot locations. Temperature limits are given by NEMA and the capacitor manufacturers. Capacitors should not be exposed to excessive dirt, acid fumes, or combustible gases, or installed in any place where it would not be advisable to operate any other piece of electrical apparatus unless it were properly protected.

2. Don't apply capacitors without proper fuses, switches, and discharge devices.

3. Don't leave capacitors connected during light-load periods, if so doing will cause an excessive rise in voltage.

4. Don't apply shunt capacitors to prevent light flicker due to welders or motor starting. This condition requires a series capacitor.

Select Electrical Equipment for Severe Service

Where dust, fumes, or moisture abounds, suitable inclosures are the answer. Equipment with ordinary protection is installed only in clean locations

GEORGE W. DONOVAN, Plant Engineer, Monsanto Chemical Company, Monsanto, Ill.

IF THERE WERE NO NEED for electric motors, controls, and other electrical equipment in places where conditions are less than ideal, it would be delightful for maintenance men throughout industry. Unfortunately, power is needed right in the thick of the manufacturing fray, where dust, moisture, fumes, and other disruptive influences are at work.

If practice makes perfect, we should really be rather expert at coping with adverse conditions. A chemical plant poses a wide variety of problems in severe conditions. Most of them are similar in general classification to those that other industry experiences, but in aggravated form. We have all the problems, and we have had to learn to live with these difficulties and keep production rolling.

Safe From Fumes

One device that we use extensively —in fact, wherever it strikes us as possible—is to remove control equipment from the operating department where corrosion conditions exist. As against exposing this relatively delicate equipment to corrosive fumes, we prefer putting it out of doors, in weatherproof cabinets. Both power and lighting panels go outside, if having them indoors would result in corrosion, shorting, and similar troubles. The pushbutton or other starting device is, of course, inside the building, close to the motor.

Our basic theory in departments with severe conditions is to close off everything we can. If we exclude the probable causes of trouble, we should live in comparative peace with equipment that continues to perform its duties. This seems to be an effective theory that we are working on, since the record backs it up.

For ten years now we have kept a record of the number of motors in the plant, and the number of burnouts. This used to run in the neighborhood of 10 to 15 percent. One year, for instance, we burned out 105 of a total of 600-odd motors in the plant. In 1940, using more than 1400 motors, we burned out 35—and we have been hitting close to 2½ percent ever since we seriously undertook selecting and installing our equipment to cope with the severity of our conditions. In view of our peculiarly rigorous conditions, we are proud of this record. Part of it, we suspect, arises from our rule that oiling motors is an electrician's job, rather than a machine operator's or an oiler's. To one fully qualified electrician on our force is assigned the responsibility for oiling all our motors. He does it during the night shift.

Boards placed over underground electrical cables prevent injury to cable or workmen during future excavations

Men at Fault

Of last year's burnouts, better than half were ascribable to the human element rather than to the conditions under which the motor had to work. There is no commercially practical way that we have found to prevent a laborer from enthusiastically turning a hose on a motor that looks dusty, in a department where he has been told to clean things up—even though it is an open-type motor. But we have found it advantageous, costwise, once the open-type motor is thus put out of commission, to replace it with a type of motor that can take even this abuse without suffering any damage.

For the past two years we have been buying no open-type motors, excepting fractional-horsepower motors for auxiliary equipment such as unit heaters, which are less expensively replaced with more of the same than supplanted with the relatively more expensive inclosed types. For most jobs in our plant we buy either weatherproof or totally inclosed motors — with preference for totally inclosed. A weatherproof motor has one inherent weakness for our conditions: If someone turns a hose on it while it is running, it can draw up water through its underside vents, and thus get into as much trouble as an open-type motor. Washing cannot hurt a totally inclosed motor, and neither can fumes. When we burn out an open-type motor, instead of rewinding it, we scrap it and replace it with a totally inclosed motor.

In departments where they are needed, we use explosionproof motors and fittings—which, incidentally, are

not weatherproof, which seems always a surprising discovery to the plant engineer who lacks experience with them. We use vaporproof lights where there is vapor to combat, and where the vapor has explosive characteristics, we use explosionproof lights.

Starters and motor controls, in our plant, are all dust-tight or water-tight. The advantages of these precautions become apparent when, as happens once in a long while, corrosive vapors leak in from another department, or when a pipe breaks overhead, dumping acid on the motors or other electrical equipment in a department. With the inclosed types that we use, it is relatively simple to turn the hose on these long enough to get rid of the acid.

We no longer buy black iron conduit, because we have found it in the long run cheaper to pay the extra cost of hot-dipped galvanized. In some departments where conditions are especially severe, we run no conduit at all, preferring to use parkway rubber-covered cable with impregnated fabric sheathing.

For wire, experience has shown that it pays us to use Type RP performance-grade rubber-covered, not only in departments with known exposure to corrosion and moisture, but also in other departments, since severe conditions may subsequently be introduced, to the discomfiture of the maintenance department when the electrical lines begin going haywire.

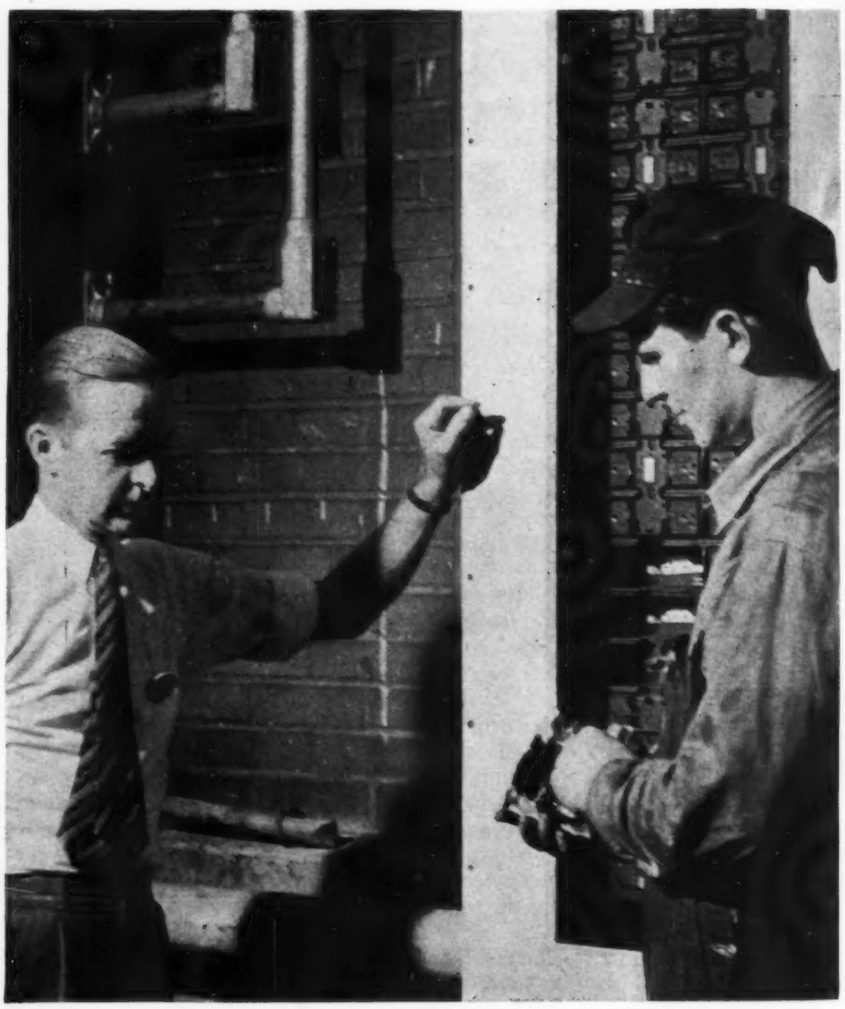
Few Overhead Wires

Outdoors we avoid overhead wire wherever possible. We have a strong preference for putting all possible power lines underground, using lead-covered or moisture-resisting cable. Even the best rubber-covered wire hung overhead eventually begins fraying and requiring replacement, whereas an underground cable of the correct type is usually there for all time to come. One method that we use in this connection has frequently proved of great interest to visiting electrical men. When we lay a power cable, we always put boards just above the buried line. Then, when anyone begins digging thereabouts, he hits the board first. When even the greenest man lifts the board to get on with his digging, he encounters the cable, and generally asks his foreman for help instead of sinking his pick through the sheathing and causing further trouble. All our old hands in the yard gang know, of course, that a buried board generally covers a cable, and is a signal to take it easy until further instructions can be obtained.

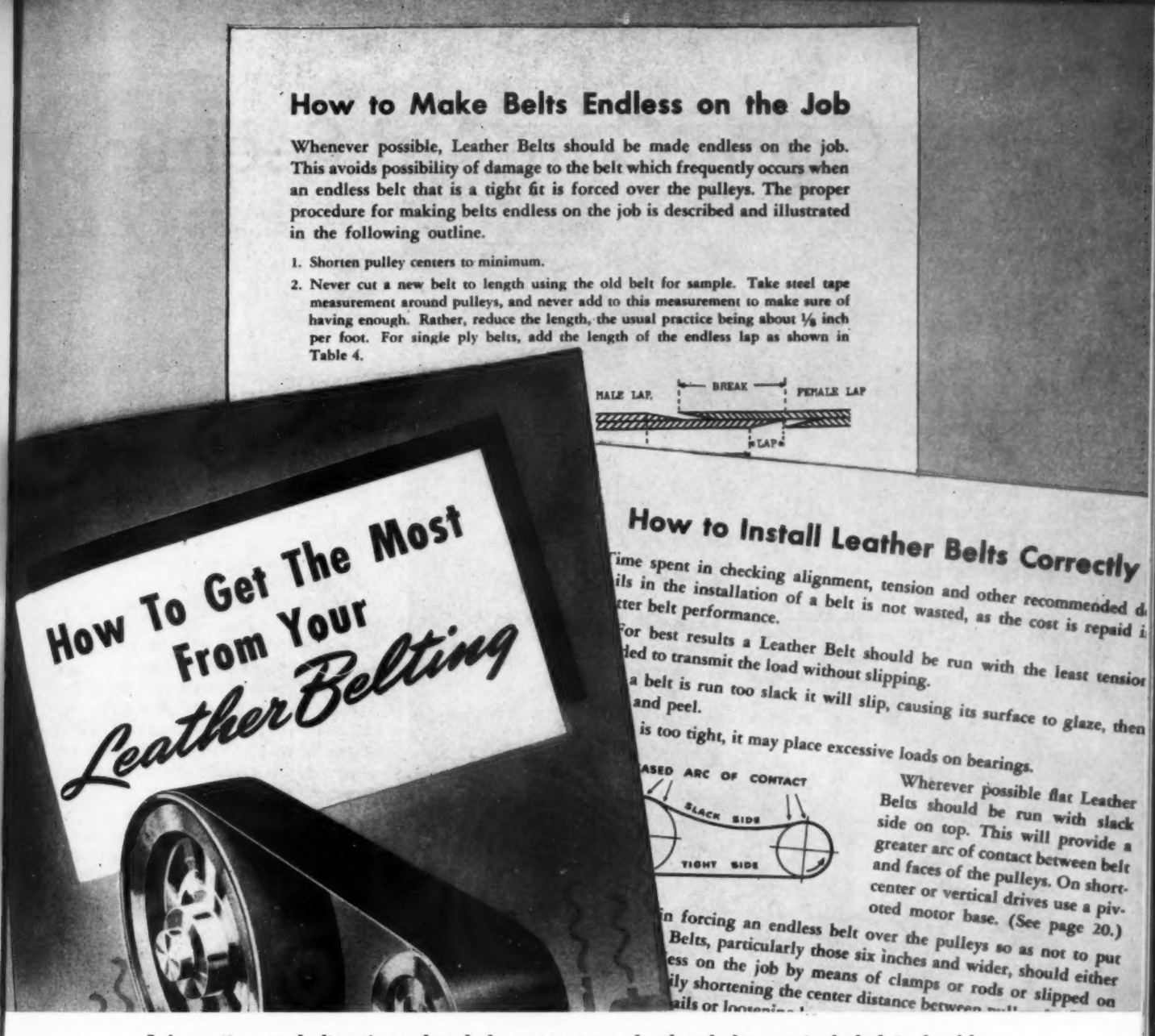
As every maintenance and electrical man knows, many of the major problems, particularly in the electrical department, arise from the lack of practical electrical know-how among the folks in the production departments. The clean-up man who turns a hose on a motor to remove the dust is no exercise in imagination—it has been done in our plant so often that we recognize it as a natural hazard. So is the clean-up man who does so enthusiastic a job of washing down an upper floor that he gets the hollow-tile wall filled with water—and fills up the conduit, if a careless electrician left off a cap or other fitting when that line was first installed.

So we consider that an important part of the work we must do in keeping electrical equipment running under rigorous conditions, is to carry on an informal, but none the less effective, educational campaign among the production departments. When a disproportionate share of motor burnouts occurs in one department, we take it upon ourselves to work out with the supervisor the reasons for this record, and the requisite precautions—even though, as any experienced maintenance man knows, any motor or equipment failure is, in the production department's eyes, without exception ascribable to the shortcomings of the electrical department.

We persistently din it into the heads of production department heads that the way in which electrical equipment is used has a direct bearing upon continuity of production, upon maintenance costs chargeable to their departments, and upon the record of the maintenance department. And because of this campaign of education, even though it sometimes takes on the characteristics of forcible feeding, our production departments are today really helping to cope with the severe conditions under which much of our equipment must operate.



Whenever possible, power and lighting distribution panels are installed outside areas containing corrosive fumes—even outdoors


How to Make Belts Endless on the Job
Whenever possible, Leather Belts should be made endless on the job. This avoids possibility of damage to the belt which frequently occurs when an endless belt that is a tight fit is forced over the pulleys. The proper procedure for making belts endless on the job is described and illustrated in the following outline.
1. Shorten pulley centers to minimum.
2. Never cut a new belt to length using the old belt for sample. Take steel tape measurement around pulleys, and never add to this measurement to make sure of having enough. Rather, reduce the length, the usual practice being about 1/8 inch per foot. For single ply belts, add the length of the endless lap as shown in Table 4.
MALE LAP
BREAK
FEMALE LAP
LAPS
How To Get The Most From Your Leather Belting
How to Install Leather Belts Correctly
ime spent in checking alignment, tension and other recommended d
ils in the installation of a belt is not wasted, as the cost is repaid i
tter belt performance.
or best results a Leather Belt should be run with the least tensio
ed to transmit the load without slipping.
a belt is run too slack it will slip, causing its surface to glaze, then
and peel.
is too tight, it may place excessive loads on bearings.
ASED ARC OF CONTACT
SLACK SIDE
TIGHT SIDE
Wherever possible flat Leather Belts should be run with slack side on top. This will provide a greater arc of contact between belt and faces of the pulleys. On short-center or vertical drives use a pivoted motor base. (See page 20.)
n forcing an endless belt over the pulleys so as not to put
Belts, particularly those six inches and wider, should either
ess on the job by means of clamps or rods or slipped on
ily shortening the center distance between
ails or loosening

Information and directions that help users save leather belts are included in booklet

Make Leather Belts Do More

THE LATEST NAME in a long list of manufacturers and associations that are deliberately limiting sales of their products by telling users how to make them last longer is that of the American Leather Belting Association. The purpose of these costly efforts is, of course, to aid the war production program by helping users of the various types of equipment to avoid troubles and delays. Also, to reduce to a minimum the amount of material and manpower that must be devoted to the production and transportation of new equipment.

The leather belting manufacturers' contribution to these praiseworthy objectives is the 22-page booklet shown here. The viewpoint of these manufacturers is well expressed thus in the foreword: "While no shortage of leather belting for essential industry is anticipated, this is no time to permit unnecessary waste. Nor is it a time to countenance the waste of power that is so essential to American industry's maximum war production."

Useful Information

In this booklet will be found the information and directions that leather belt users must have, and follow, in order to select, install, and maintain their belts properly. Among the subjects treated in the 13 sections are: A guide to maximum belt performance; how to order leather belts; horsepower ratings for oak-tanned flat leather belting; how to install leather belts correctly; how to make belts endless on the job; leather belt maintenance; how to shorten leather belts; cleaning and dressing leather belts; how to align shafting and pulleys; modern group drives.

Wherever the subject matter allows, the sections are illustrated with simple drawings.

Copies of this booklet may be obtained, free, from the American Leather Belting Association, 53 Park Row, New York, N. Y., or from leather belting manufacturers.

How Color Can Aid Seeing

Color in the plant should not be merely a matter of personal taste. It is the copartner of light. Make it work for you to speed production

FABER BIRREN, Industrial Color Consultant, New York

GOOD VISIBILITY is as much a matter of color as it is of light. In the problem of illumination, foot-candles and their placement are only a part of devising an adequate lighting system. Reflecting surfaces that distract the eye and extreme contrasts of brightness and darkness in a working space rob light of its full power unless they are toned and balanced.

Color, properly applied, can be utilized to help control glare, extremes in light and darkness, distractions, and fatiguing changes in eye adjustment. Knowing the psychological and physiological make-up of the average human being, science, through proper "engineering," has been able to put color to work.

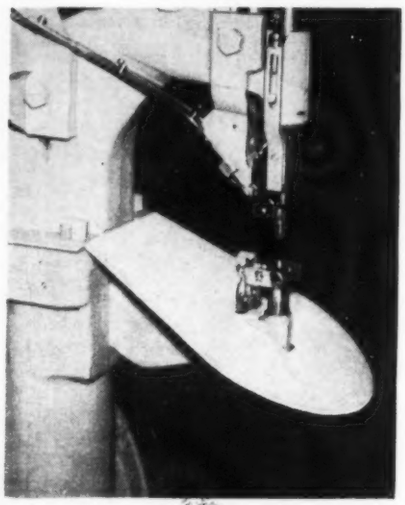
Considering the necessity for good visibility in efficient production, reduced hazards, and improved labor morale, use of color is a simple but important discovery in the relief of fatiguing eyestrain.

The major principles of the technique of color in industry are simply described and illustrated in this article. Taking a power lathe as a problem in visibility and production, ways are illustrated in which color may be functionally used to serve the needs of modern industry in the war effort. The star shown on the sketches represents the material to be worked —a piece of metal—and is the same tone in *all* illustrations.

Watch Out for Extremes

Figure 1 portrays most of the bad conditions of the past. The machine is drab gray or black. The ceiling and walls are dingy, either through a crying need for a coat of paint or the survival of some of the old "factory" finishes of another era. The floor is black or oily with age.

While better lighting may effect an improvement, the worker will still be at a disadvantage until other changes are made. And probably most of the added cost for more light will be wasted. Where dark materials are seen against a dark ground, the eye will be taxed no matter what amount of light is showered down. Tests have shown that a piece of black thread on *white* cloth will be as visible under one foot-candle of light as a piece of black thread on *black* cloth under 2100 foot-candles.



Riveter equipped with oblong shield to blank out space and concentrate the vital working area

In Figure 2 the usual expedient of painting the ceiling and walls white is shown. The machine and the floor are still dark as before. While there may be a better distribution of light, the condition here may conceivably turn out to be worse than before.

To begin with, the opening of the pupil of the eye, being regulated by the brightness over the larger field of view, may reduce visibility of the gray metal by withholding an adequate amount of light from the retina. Again, the white wall, being far more brilliant than the material or the machine, may prove a source of glare and distraction. The contrast may produce blinding after-images and blurred vision.

The task of seeing is easier when the area of concentration is approximately equal in brightness to its surroundings. Darker surroundings are next best. The worst situation is that in which the surroundings are bright and the task dim. As a rule, darkness is seldom as fatiguing as brightness, assuming that the amount of light concentrated over the working area is the same in both instances.

In Figure 3 many of the good features mentioned above have been capitalized and the bad features eliminated, thereby striking nearer a happy mean for better visibility:

1. The ceiling is white for good light reflection. It is high enough out of the range of vision not to introduce glare.

2. The wall is a light pale gray having a reflection factor of approximately 50. This wall area is necessarily toned because of the gray color of the material being worked. Its color therefore will have less tendency to constrict the pupil. It will likewise prove less of a distraction.

3. The machine and floor are a medium gray, having almost the same brightness as that of the material. This eliminates frequent rapid shifts in the fixation of vision between areas of differing brightness.

4. The general, all-over effect is one of subtle contrast, devoid of glare and startling extremes in light and dark. *This, above all, is the major requirement of good visibility.*

5. The circular area indicated behind the star in Figure 3 represents a shield or panel fixed behind the machine. This is to effect a concentrated seeing area that blanks out meaningless space. In most plants the average machine stands at a distance from the wall. Frequently the worker must look downward, the background of his task being a dark floor or shadowed space. By blanking off this space and confining the worker's vision to his job, it is possible: (a) To build up a more appropriate contrast with materials; (b) to shut out distractions of motion which may exist in the distance; (c) to hold the adjustment of the worker's eye to a more uniform level; (d) to eliminate fatiguing changes in the accommodation of the lens of the eye to near and far points.

This use of panels has exceptional merit in large interiors where each man and each machine is expected to perform at maximum efficiency. It

has been tried with excellent success in a number of applications. A power riveter equipped with panel is shown in the halftone.

While it is known that the acuity of the eye increases as the level of illumination is increased, it must be remembered that great contrasts have adverse influence and may, in fact, waste light. It is also known that the eye reacts and adjusts itself to brightness more rapidly than it does to darkness. This fact automatically questions any supposed merit in favor of white walls and bright parts on machines. While they may add to light reflection, they may at the same time lower visibility.

Looking from a light area to a dark area (from a white wall, for example, to a piece of gray metal), the action of the pupil will be slow. Several seconds may pass before the "blind" period is overcome and visual acuity restored. Let the action of seeing, therefore, lead the eye of the worker from a bright wall—which is meaningless—to a fairly dim piece of metal —which is vital—and the halt periods which tax his concentration will cut down his production as well as make him more susceptible to injury.

Subdued Tones Restful

Let the meaningless wall be toned down to reduce glare and distraction, leaving the working area bright, and production rates will promptly rise. The adjustment of vision from a subdued tone to a brighter one is almost instantaneous. The product or the task should never be thrown into competition with its surroundings. The field of view should, if possible, be of fairly uniform tone throughout.

As to the quality of color, too much purity will have the same distraction as too much brightness. Rich colors are to be avoided in preference to grayish tones which (1) have subtle contrast with the hue of the material, (2) complement interiors with a feeling of warmth or coolness, (3) prove psychologically pleasing as revealed by careful research of employee likes and dislikes.

Such care should also guide the selection of color for other sections of the plant. Restrooms, locker rooms, and washrooms may be more colorfully treated and preferably illuminated at lower, more restful levels. White and light tints should be applied in corridors, stairways, and storage spaces to aid seeing. To use color as a "change of pace" in the factory will afford a desirable relief from monotony and help to bolster the morale of employees.

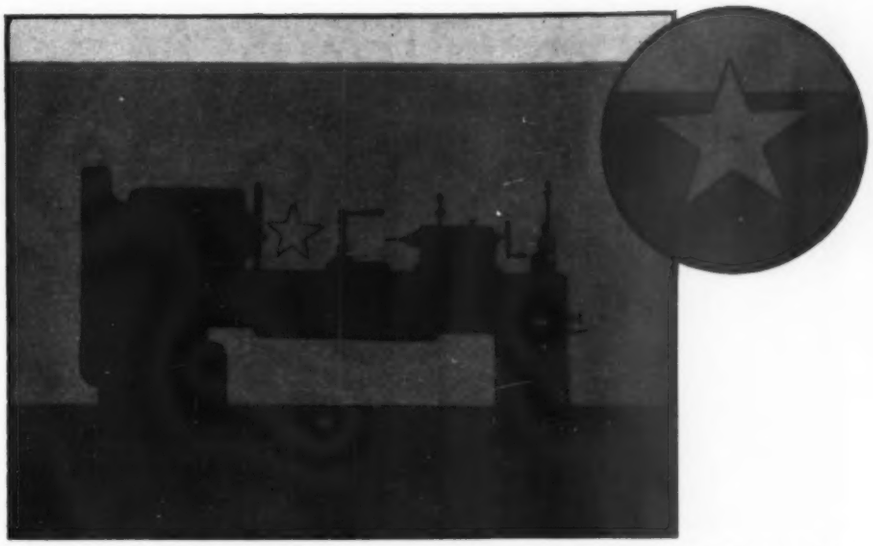


Figure 1 portrays dullness of dark machine against dingy background

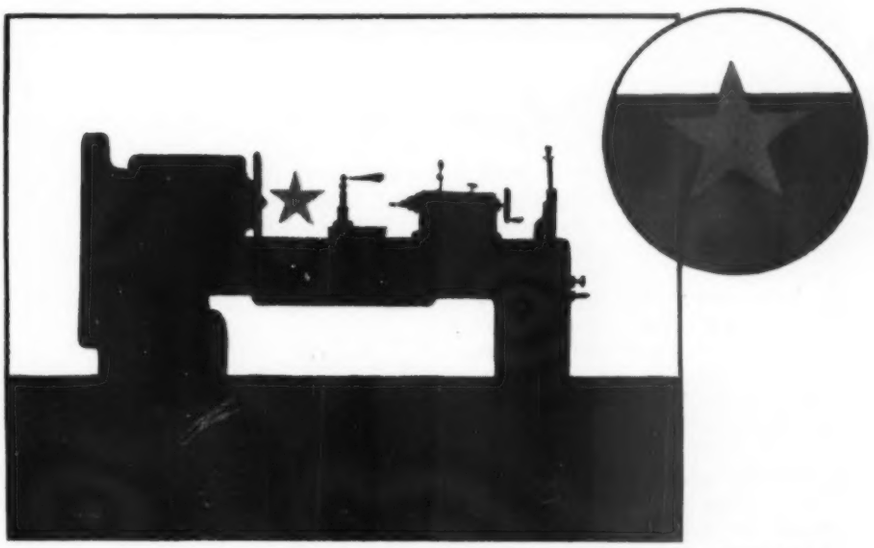


Figure 2 shows glare of black machine against white wall, dark floor

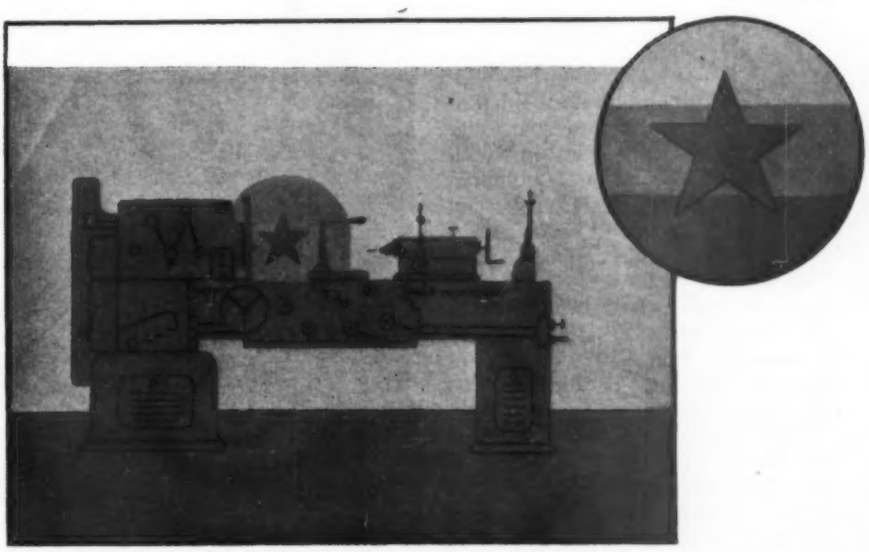


Figure 3 is example of desirable color contrasting. Extremes absent

Easy to Clean Machines

There are good reasons why production machines and other equipment need to be cleaned, and wartime demands make it essential to pick the quickest, easiest way to do the job. Here are answers to some common problems

DR. R. W. MITCHELL, Technical Director, Magnus Chemical Company, Garwood, N. J.

CLEAN THEM right on the floor. That is the answer to the question of how to keep production machines clean when they are operating perhaps 24 hours a day, and cannot be taken out of service long enough to be dismantled and scrubbed up. Cleaning is needed, nevertheless, because dirt is bad both for operators and for machines. It lowers morale, tends to make operators careless. In bearings and other parts it may easily cause major damage to machines.

When machines are cleaned on the floor, they must be sprayed with one of the available compounds suitable for this purpose. For example, a mixture of an emulsifiable solvent concentrate and safety solvent will penetrate deeply into dirt deposits and loosen the bond between the grease, oil, and dirt and the metal surface. Because this sprayed mixture has a comparatively low viscosity, it tends to penetrate into crevices and ordinarily inaccessible spots on a machine, so that practically all parts are exposed to the penetrating and dirt-loosening action.

After a few minutes, to allow the cleaner to soak in and do its work, the entire machine is flushed clean with water from a hose under moderate pressure.

Must Avoid Rust

The cleaning solution itself is harmless to metals, rubber, gaskets, and other machine parts. Flushing with water is usually all that is required to remove it. The only precaution necessary is to avoid rust on machined surfaces—usually accomplished by using warm or hot water in the final stages of flushing off, or by drying with compressed air. Water should be removed from any pockets or sealed-off openings in the machine with rags or compressed air.

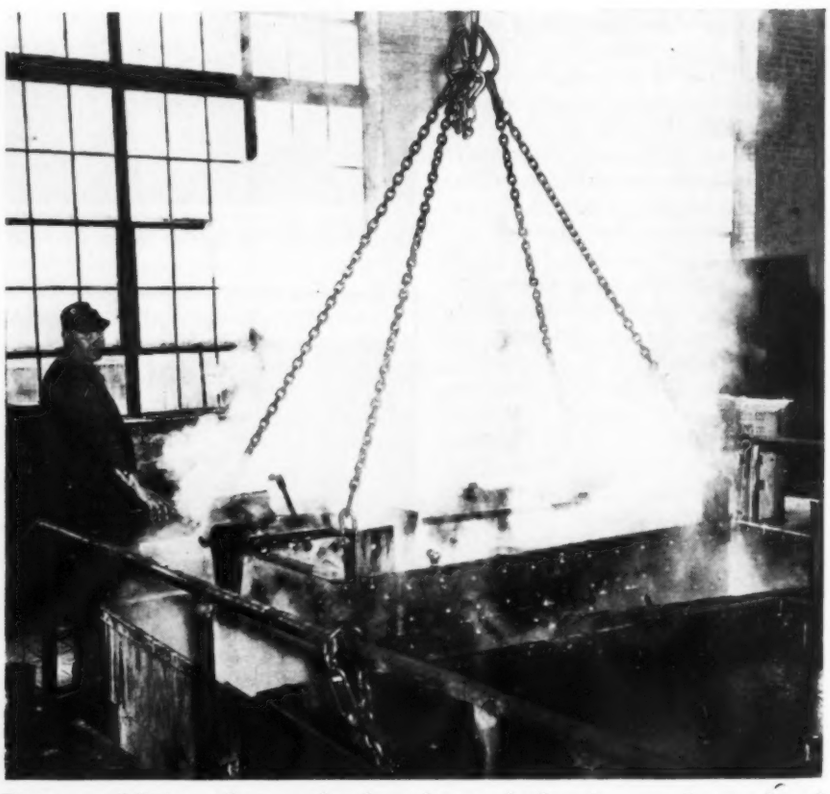
Unless the plant floor is provided with drainage channels and collecting sumps, disposal of the flushing water may be a problem. In many plants the results obtained by this method of cleaning have justified the installation of suitable drainage arrangements.

However, it is possible to use this method even where drainage facilities are not available. The area containing the machines to be cleaned is surrounded with sawdust, sand, or some other absorbent material. When the flushing job is finished, the sand or sawdust, which has absorbed the flushing water, is swept up.

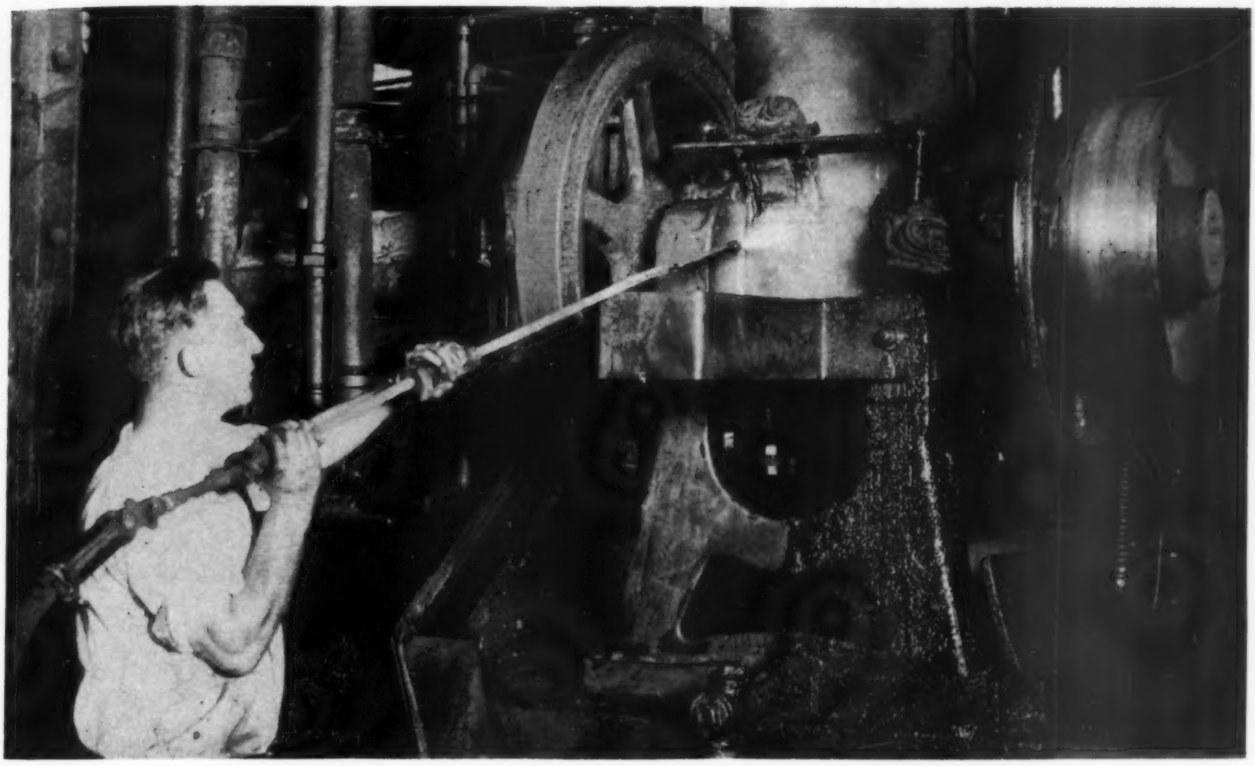
When a machine of any kind has been moved to the repair shop for maintenance or repair, the first job is usually one of cleaning. Either the machine is cleaned prior to dismantling, or it is taken apart and the parts are cleaned before repairing.

If the machine has been in regular service and has not been exposed to conditions that cause serious rusting, cleaning of dismantled parts can be usually done by dipping or soaking them in the same kind of solution employed for cleaning machines on the floor, followed by a pressure rinse with water. The solution can be warmed slightly to speed up the work, although it is effective at room temperature. If heavy grease or oil deposits have been burnt in or carbonized, it is often necessary to use a different cleaner, compounded to act upon these persistent deposits more effectively. This specialized cleaner is called a cold tank cleaner because it is used at room temperature.

Work is soaked in the solution in a still tank. After a suitable soaking period, which depends on the nature of the dirt, parts are removed from the solution and flushed with water or with safety solvent. As a rule, very



Piping and fittings that need only a thorough cleaning can be rendered useful again by boiling them in a suitable cleaning solution



When time is short and machines cannot be taken out of service long enough to be dismantled, spraying them with the right cleaner and hosing them with water do a satisfactory cleaning job

little brushing or scraping is required to remove most of the deposits, and pressure flushing with water is usually satisfactory.

Where the machine has been out of service for some time and rusting has taken place, it may be necessary to use stronger cleaners and to follow up the cleaning operation with a special rust-removing treatment. It is often desirable to strip old paint from such machines .

Paint stripping and cleaning can be combined in one operation by the use of a suitable heavy-duty alkaline cleaner. The solution must be boiled and the length of time required for thorough cleaning will depend on the kind and amount of dirt involved. As a rule hot cleaning tanks are heated by a submerged steam coil at the side of the tank or by a gas immersion burner. Obviously, heavy parts should be handled by suitable cranes or hoists, since with these hot heavy-duty alkaline cleaning solutions care must be taken to avoid serious burns, which are particularly dangerous because they combine chemical and heat damage.

Rinsing of such work should be thorough and be done by running water, rather than by soaking in a still tank. The rinse water should enter slowly at the bottom of one end of the rinse tank and overflow at the opposite end at the top. Very large parts are perhaps best rinsed by hosing down.

Rust may be removed satisfactorily by the use of specially compounded inhibited acid cleaners that will attack and loosen rust without harming the metal. Treatment involves immersing the rusty parts in the rust-removal solution just long enough to clear away rust and scale, followed by thorough rinsing and a final security dip into an alkaline cleaning solution to neutralize all traces of acid.

If parts are to be worked on immediately, and the machine is to be put into service after reassembly, no protective treatment is required. If they are to be stored for standby service or future use, it is better to treat the parts with a rust-preventive compound.

Salvaging Junk

Every plant has plenty of piping, fittings, and various parts that under normal conditions might be junked or allowed to rust away in the plant yard. Today practically all such material must be conserved, not alone as an economy measure, but to insure replacement parts.

The extent of the set-up required for salvaging such material will depend on the amount of work to be handled and the kinds of parts involved. In general, however, the process will involve the installation of a tank provided with heating arrangements in which the work can be boiled.

The cleaner used in such operations is usually of the heavy-duty type, capable of removing not only oil and grease, but of stripping paint as well. For steel and iron parts and fittings, the solution can be quite strong. For brass and other copper alloys, however, care should be taken that a cleaner suited to these metals is used.

It is important that such work be dried thoroughly, since it will ordinarily be put into storage after cleaning. Drying can be most readily accomplished by immersing the work in boiling water until it picks up enough heat to be self-drying upon removal.

Rust may be removed from fittings by the same method used for machine parts. A protective coating is of great importance in the case of pipe and fittings, which usually go into storage after cleaning.

Another method of cleaning pipe, fittings, and other parts involves the use of a steam gun with a heavy-duty cleaner compounded for this type of cleaning. The steam gun syphons up the cleaning solution from a tank or drum and ejects the solution in atomized form by steam pressure.

MAINTENANCE SHORTS

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary maintenance accomplishments. Accepted articles will be paid for

Grinds Tools to Give Rough Finish

SOURCE—Carboloy Company, Inc., Detroit, Mich.

Many types of metal do not form a chemical bond when sprayed on. When that happens it is necessary to roughen the surface of the part to be sprayed in such a manner that a mechanical bond will be formed.

All kinds of expensive tools were developed to do that job over the past year or two—specially knurled tools, dovetail-shaped tools. These tools did a pretty good job when the base material was easy to machine—and tool life was great enough to stand the relatively high cost. But when the hard-to-machine alloy steels came along, the job proved a little too tough.

Finally, a user of metallizing equipment came up with the idea that the special tools might be tipped with carbide to give them greater life.

Engineers took one look at the problem and came back with a question: "Why use expensive special tools? If you want to produce a really smooth surface you use a correctly ground tool. Ergo, if you want a really rough one, all you have to do is grind it wrong. Just grind it the opposite from the way you would grind it if you were trying to produce a smooth surface."

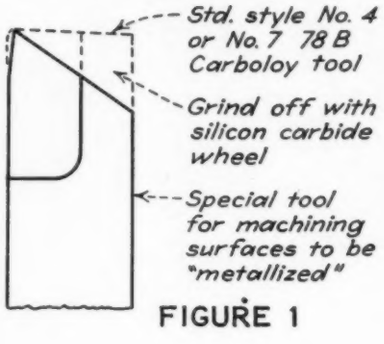
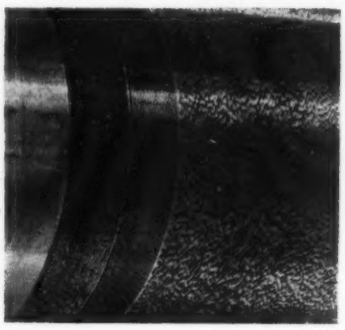

Std. style No. 4 or No. 7 78 B Carboloy tool
Grind off with silicon carbide wheel
Special tool for machining surfaces to be "metallized"

FIGURE 1



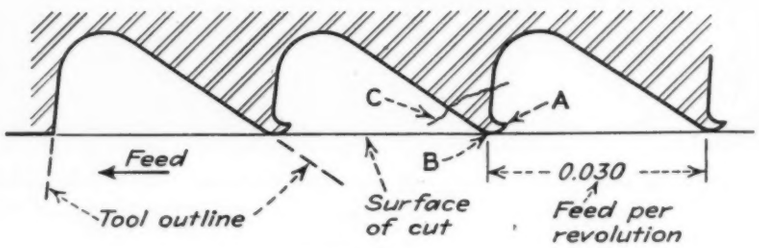
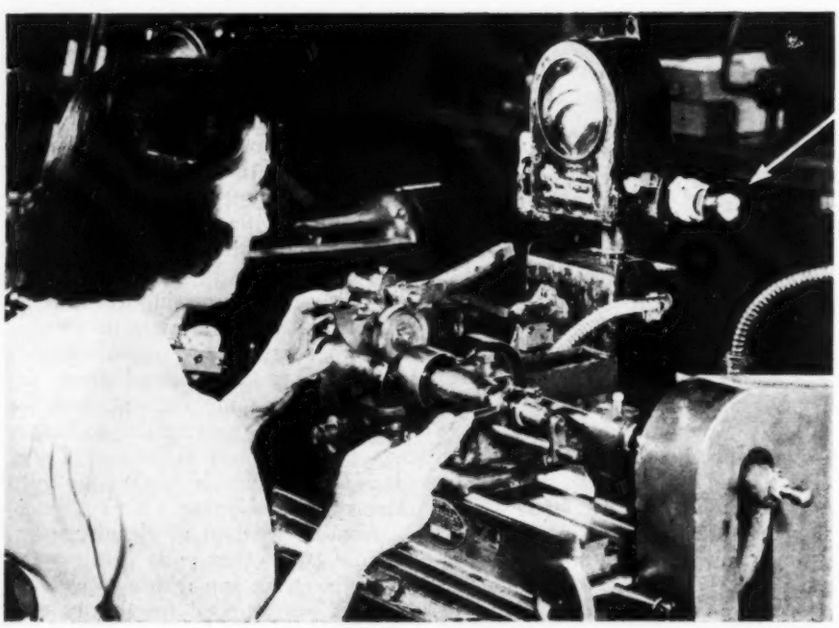


FIGURE 2

A simple standard tool was taken out of stock and, in a minute or so, the nose was ground to the unorthodox (to say the least) shape shown in Figure 1. What happened when a piece of tough alloy steel was machined with it is shown in the photograph. The cuts are at different depths (0.010, 0.015, and 0.020 inch respectively) and the feed is approximately 0.030 inch. The surface at extreme right is what the 0.020-depth and 0.030 in. feed produced.

It was exactly what the metallizing people had been looking for. The "incorrectly ground" tool—in cutting—raised a burr between the tool marks, and the combination of "cockeyed" tool angles was such that the tool-cutting pressure pushed the burr over into horizontal position. The photograph and the drawing ("C" in Figure 2) show that the tool also lifts some of the crests intermittently, thereby producing a mottled surface forming an ideal base for the adhesion of sprayed metal. Incidentally cutting speed on this tough material was well up—around 200 to 250 surface feet per minute



A small lamp connected to an automatic timer simplifies a finishing operation at one General Electric plant, and minimizes possibility of spoilage. The girl is finishing shafts for demand registers, on a burnishing machine. When sufficient time has elapsed to provide finish, the timer turns on the light

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Simple Puller Speeds Removal of Cotter Pins

This suggestion won an award from the War Production Board:

Usual practice in removing cotter pins has been to straighten the ends and pull

STEPPING STONES TO VICTORY!

EACH landing we make, each enemy position we capture is a stepping stone toward Victory. Each is part of a great chain, leading to Berlin, Rome, and Tokio. But remember, the men who tread this path need backing from all of us at home.

For example, strict conservation of batteries is vitally important . . . and the four simple rules for battery care may be compared to stepping stones. Follow them to make batteries last. Buy to last and save to win.

FIRST STEPPING STONE—Keep adding approved water at regular intervals. Most kinds of local water are safe in an Exide Battery. Ask us if yours is safe.

SECOND STEPPING STONE—Keep the top of the battery and battery container clean and dry at all times. This will assure maximum protection of the inner parts.

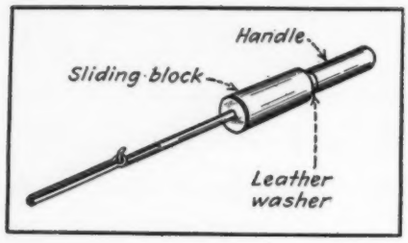
THIRD STEPPING STONE—Keep the battery fully charged—but avoid excessive overcharge. There's always a right way to do any job and a storage battery will last longer when charged at its proper voltage.

FOURTH STEPPING STONE—Keep records of water additions, voltage, and gravity readings. Don't trust your memory. Write down a complete record of your battery's life history. Know what's happening!

If you wish more detailed information, or have a special battery problem, don't hesitate to write to Exide. We want you to get the long-life built into every Exide Battery. Ask for Booklet Form 1982.

THE ELECTRIC STORAGE BATTERY CO., Philadelphia
The World's Largest Manufacturers of Storage Batteries for Every Purpose
Exide Batteries of Canada, Limited, Toronto

Exide
IRONCLAD
BATTERIES



the pin out with pliers, a screwdriver, or other tool.

To simplify and speed up this operation the puller shown in the illustration was constructed. It consists of a steel rod having a hook at one end and a handle at the other. A heavy sliding weight rides on this rod. A leather washer slipped over the rod is interposed between the weight and the handle.

When removing a cotter pin the hook of the puller is slipped through the head of the pin and while the handle is grasped firmly with one hand the sliding weight is driven sharply against the leather washer by the other hand. A few blows will suffice to straighten the pin and remove it.

•

Loads Grease Guns Directly From Barrel

This suggestion won an award from the War Production Board:

The accompanying illustration shows a method of loading standard grease guns directly from a large container by means of a special fitting. This improvement was worked out to eliminate the waste of grease and time, and the cleaning up required when grease guns were filled by the method formerly used.

As will be seen, a threaded fitting that will accommodate a standard grease gun when the detachable end is removed, was inserted near the bottom of a discarded 100-lb. grease container. To fill the grease gun the end is removed, the handle pushed in, and the barrel is screwed into the fitting in the container. When the handle of the gun is pulled all the way out the barrel will fill up. After the gun has been unscrewed and the end replaced, it is ready for service.

Contamination and loss of grease from the container are prevented by screwing over the end of the special fitting a cap which is removed only when a gun is to be filled.

Suggested by M. Schonfeld, Paraffine Companies, Inc., Emeryville, Calif.

•

Priorities for Repair Crews

This suggestion won an award from the War Production Board:

A priority system for plant mechanical labor services will insure that units on the most vital war production work will be taken care of in advance of less vital units.

With small mechanical maintenance crews on the night shifts, attention will be centered on the most important units.

If simultaneous breakdowns occur on two units, the mechanical repair crew will have definite instructions as to which unit is to receive attention first, and the more vital equipment will be out of service for the minimum time.

Suggested by R. Lewon, Paraffine Companies, Inc., Emeryville, Calif.

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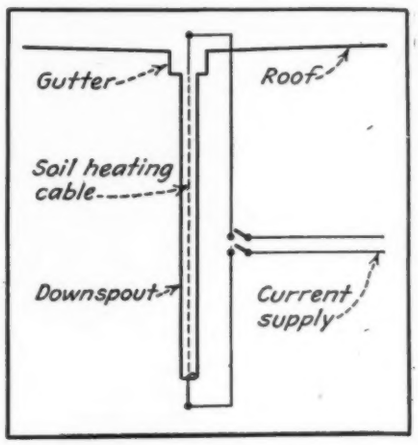
Soil Heating Cable Thaws Downspouts

S. H. COLEMAN, Staunton, Va.

During periods of extremely cold weather, ice formation in the downspouts from roof rains frequently give trouble, particularly where the downspouts are exposed. Water, resulting from the melting of snow on the roof, runs down these drainage pipes and often freezes to their inner surfaces, an action that is progressive and eventually fills the entire cross sectional area of the downspout, completely blocking drainage.

In the design of roof drainage piping this fact should be taken into consideration and the downspouts run inside heated areas. Where this is impossible or where changing downspout locations would prove costly, some method of avoiding stoppages caused by the ice must be resorted to.

Soil heating cable, designed primarily for horticultural and agricultural use, offers an ideal solution of this problem. This cable is built up of a nickel chromium wire covered with asbestos, taped with varnished cambric, and encased in a lead sheath for protection against moisture. If a length of this cable is placed in the downspout and supplied with current through a manually or thermostatically operated switch, the downspout can be prevented from freezing or, if freezing does occur, quickly thawed.



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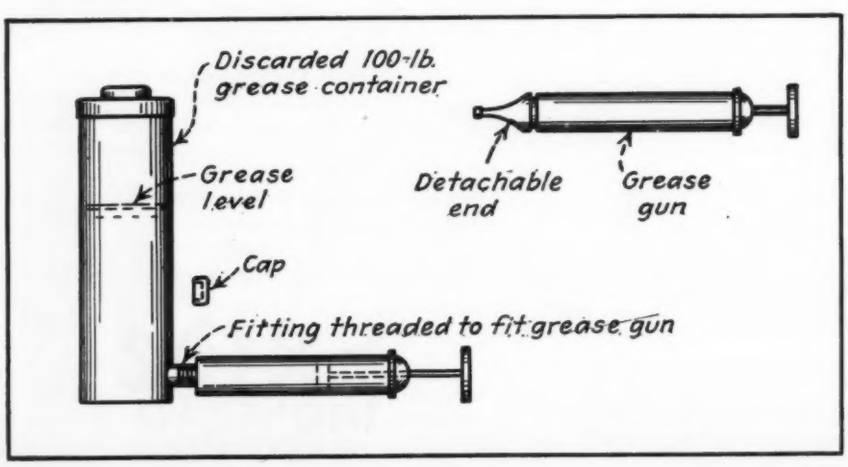
Converted hay-bailing machines doing their part in the salvage program at the Caterpillar plant in Peoria, pack and bind up to 40 tons of paper a month.

•

Cleaning Motor Ends Flashover

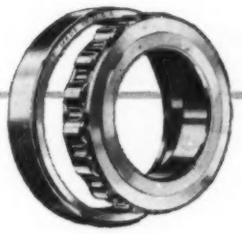
LIONEL A. HUNT, St. Catherines, Ontario, Canada

A 2200-volt synchronous motor flashed over at the sliprings as it was started. The induced rotor voltage at standstill was 700 volts and the rings were spaced for this value. The rings had been stoned and cleaned and the dust removed. Careful investigation, however, revealed that pockets formed by the slipring construction were full of bronze dust which had escaped the cleaning process. When the motor was started, some dust was thrown out and so lowered the dielectric value of the air between the brush boxes that flashover followed. All the dust was removed and no further trouble occurred.



Again, THANKS *Industry*

for our 50th and most important year



IN JANUARY, 1942, we gratefully thanked Industry for its half-century of confidence in Hyatt. That message heralded the beginning of the 50th year of Hyatt Roller Bearings.

Since then . . . with our country in peril of its life . . . American industry has thrilled the Allied world with startling feats of production.

Like soldiers on attack, men of the design boards and production lines swung to the job of pouring out the machines that will win this mechanized war.

Industry called on Hyatt for vital bearing assignments in planes, tanks, ships, guns . . . and in the machines that build them.

Creating bearings for such vital service was more than a responsibility. It was a privilege. It was a command!

Without lost motion the whole productive effort of Hyatt became a single aim . . . to rush the most devastating fighting power possible into the hands of our fighters and their allies.

Under the impetus of our fight for freedom, Hyatt precision production has swelled tremendously. This took place despite the many necessary changes made in designs and sizes, tools and methods . . . all having been accomplished without losing a stride in the race against time.

Working with you . . . for America . . . has given us the chance to be extra proud of our fiftieth year, just completed. It was by far Hyatt's most important year . . . in manufacturing achievement and in contribution to the great cause.

Therefore, for giving us a golden opportunity in our golden year, again we say THANKS, INDUSTRY.

Hyatt Bearings Division, General Motors Corporation, Harrison, N. J.

1892 ★ 1942
Fifty Fifty... FOR 50 YEARS
INDUSTRY AND HYATT PARTNERS IN MECHANICAL PROGRESS

HYATT ROLLER BEARINGS

Power Circuit Breaker Upkeep and Trouble Shooting

Frequency of inspection depends a great deal on local conditions, type of installation, operating duty, atmospheric conditions, and other factors, but a general check should be made at least once a year.

Check the oil every three months.

Under severe duty (such as interruption of heavy short circuit) special inspection may be advisable.

Where the conditions demand that circuit breakers be kept in either the open or the closed position for long periods of time, it is recommended that arrangements be made to open and close them periodically several times in succession. This precaution will aid in keeping all parts in proper operating condition.

Parts to Check and What to Do

CAUTION: Before starting the inspection or making any adjustments to power circuit breakers, MAKE SURE that all lines leading to them are dead, and that the breaker is completely disconnected from the buses and lines.

Grounding

Inspect the grounding connection to the breaker frame, to assure safety. See that this connection is intact and connected directly to a dependable ground, directly to the station ground bus.

Where the breakers are mounted in metal-clad switchgear they are inherently grounded and in such cases it is necessary only to see that the switchgear ground is intact.

In addition be sure that all breaker studs and current carrying parts are adequately grounded before touching any part, and that this temporary ground is maintained throughout the inspection and adjustment period.

Contacts

The functions of the contacts are to carry current and to interrupt current (both under normal switching operation and under fault or short circuit conditions). An inspection of contacts therefore involves a check of their adjustment and condition.

Inspect the contacts.

(For indoor and pole- or frame-mounted outdoor oil circuit breakers the oil tank must be removed. For large, floor-mounted outdoor breakers, the oil should be withdrawn and the manhole cover removed to permit entry and access to the contacts. With air-blast and other oilless types, access to the contacts for examination and inspection or adjustment, is easily obtained.)

See that the contacts are properly aligned, that contact surfaces bear with firm uniform pressure, and that they are adjusted according to manufacturers' recommendations. Replace badly pitted or burned contacts before they are burned away sufficiently to cause damage to other parts. If the contact surfaces are only roughened they may be smoothed down with a clean fine file, or with clean, fine sandpaper.

Note: Avoid too much dressing of butt-type contacts. A roughened butt contact will often carry current as well as a smooth one. Obviously a large projection, or "bubble," caused by unusual arcing, should be filed.

Take particular care with silver-to-silver contacts. Silver oxide, when heated by passage of current, for example, will revert to the metallic form. Consequently such contacts require very little maintenance. This does not relieve the maintenance inspector of the duty to examine them for good condition. If dressing of line-pressure contacts is necessary, take care to maintain the line contact.

Mechanism and Breaker Operation

See that the breaker and operating mechanisms work smoothly and freely without binding. If electrically operated, breakers should always be first operated manually to determine the absence or presence of binding. Check adjustment of toggles, buffers, stop clearances, and dashpots, over the entire operating cycle. See that the mechanisms are clean and free from accumulations of dirt. Ordinarily, circuit breaker mechanisms require very little lubrication. In general, a few drops of good grade machine oil at bearing points occasionally will provide sufficient lubrication.

In testing the operation of the mechanism take care not to operate oil breakers excessively (especially electrically operated mechanisms) while the tanks are removed or without oil. When operating without oil (during test) coat the contacts lightly with vaseline or other lubricant.

The length of the breaker stroke and its opening and closing speed should be measured or checked and adjusted to manufacturers' specifications.

Electrical Operation

Check the operating voltage at the mechanism terminals with full operating current flowing to be sure it is adequate for correct operation.

Check the closing relay, to make sure that it is functioning properly.

Check indicating lamps, replace any that are burned out.

Check the opening and the closing time (with the oil circuit breakers properly filled with oil and all breakers in normal operating condition), with the operating control voltage at normal or specified value.

Check the tripping arrangements (trip coils, etc.) to assure positive tripping when tripping is required. The red indicating lamp must be in the trip coil circuit.

Note: In connection with schedule testing of protective relays it is recommended that the relays be operated

(*Continued on page 150*)

Prepared by WAYMAN A. HOLLAND, Switchgear Division, General Electric Company

NO. 1 OF A SERIES

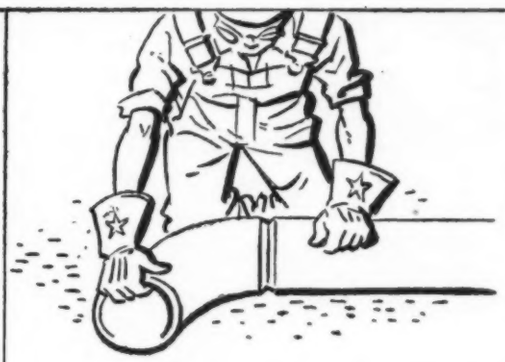
HOW TUBE-TURN WELDING FITTINGS BENEFIT WAR INDUSTRY

The ★ FIRST ★ WELDING FITTINGS 1ST AND STILL THE BEST

How Tube-Turn welding fittings speed-up piping installation for war production!

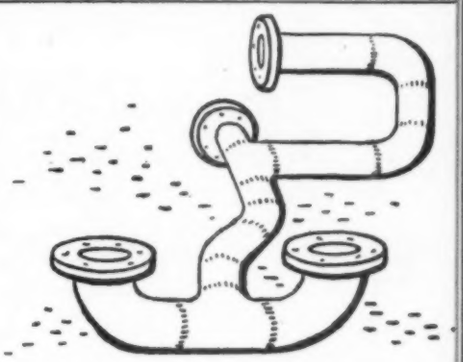
ER, FASTER, SAFER WELDING

rn fittings require only easy circumfer- utt welds—which insure faster, better, safer by both veteran and novice operators.



ALIGNING TIME GREATLY REDUCED

Tube-Turn fittings simplify lining-up operations —because their uniform wall thickness and true circularity permit quick alignment with pipe.



WHOLE SECTIONS CAN BE PRE-ASSEMBLE

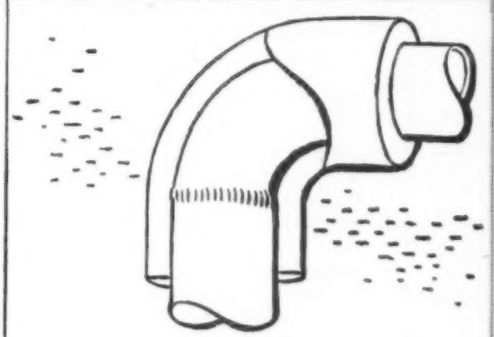
As Tube-Turn fittings and welded joints star strain and save weight, piping sections can b welded on the ground to save time, then erecte

NO THREADS TO CUT

removes the inefficiencies of threaded lus the labor and time applied to thread- ube-Turn fittings come ready to install.

NO TORCH CUTTING OR FABRICATION

Since all Tube-Turn fittings are installed with easy-to-make butt welds, they eliminate time-consuming, complicated cutting and fabricating.



FASTER AND EASIER TO INSULAT

Tube-Turn fittings are insulated as readily as th pipe, for the welds form one continuous tube. Elim inating many flanged joints shortens covering time

FLANGED JOINTS SPEED ERECTION

fittings supplant the need for many of ged joints necessary in screwed piping, aterially reduces over-all erection time.

FEWER HANGERS OR SUPPORTS NEEDED

As welded piping weighs less and stands vibration better than flanged systems, the fewer hangers needed save installation time on these items.

. . And you get stronger, leakproo systems that virtually eliminate piping maintenance or failures that can slow down or paralyze vital war industry!

TUBE TURNS
INCORPORATED

Branch Offices: New York, Chicago, Philadelphia, Pittsburgh, Cleveland, Dayton, Washington, D. C., Tulsa, Houston, Los Angeles. *Distributors everywhere.*

BE-TURN *Welding Fittings*
TRADE MARK

Power Circuit Breaker Upkeep and Trouble Shooting *(Continued from page 148)*

Parts to Check and What to Do *(Continued)*

to cause actual tripping of their associated breakers, thus assuring integrity of the entire protective means.

Bolts, Nuts, Pins, Cotter Pins

Inspect and see that all bolts, nuts, pins, cotter pins, rods, levers, and links are kept in place and tight.

Replace any broken or worn parts.

Connections

See that the joints of connection bars and cable terminal connectors are clean and tight.

Accessories

Check accessories to assure proper functioning.

Undervoltage device—Check to see that tripping will be positive upon drop of voltage to or less than the predetermined value.

If of time type, check the time setting.

Auxiliary switches—Examine contacts to assure good condition. Dress or replace defective parts. Check adjustment.

Interlocks—Examine mechanical or electrical interlocks to assure that all functions are properly performed, and adjustments correctly made.

Oil for Oil Circuit Breakers

Examine and test the oil. If it shows signs of moisture, carbonization, or dirt, it should be filtered and retested. If the dielectric strength of the oil of the breaker in service is less than 16,500 volts when tested in a standard gap (that is, between 1-in. disk terminals spaced 0.1 inch apart) it should be filtered. The dielectric strength of new oil should be not less than 22,000 volts. Always put even new oil into tanks through the filter press.

See that the oil level in the tanks is maintained at the proper height. Be sure that the oil level gage indicates the actual oil level.

Internal Insulating Parts of Oil Circuit Breakers

See that all bushings and insulating parts inside the tank usually immersed in oil are thoroughly cleaned to remove all traces of carbon that may remain after the oil has been drained. It is necessary that the oil be removed and the inside of the tank and all internal parts of the breaker be thoroughly cleaned at intervals.

Bushings or Insulators

Clean the external surfaces of the bushings and insulators to remove any accumulations of dirt or other deposit. This is especially necessary when the breaker is located where cement or metallic dust, salt spray, or acid fumes are present.

Check dielectric strength of bushings or insulators by power factor test. When routine power factor measurements indicate that a bushing may be in an unsatisfactory condition, it is desirable to measure the power factor of the bushing with the influence of other insulating structures eliminated. For such tests both ends of the bushing should be disconnected and the porcelain surfaces should be clean and guarded (metallic conductor in contact with the surface of the porcelain). Lower the oil in the breaker tank to a point below the bushing and remove any insulating barriers adjacent to the bushing. If the test under these conditions shows excessive power factor, it then becomes necessary to recondition the bushing in accordance with instructions from the manufacturer.

Inspect the bushing supports to make sure that vibration due to breaker operation has not caused the bushings to move, resulting in misalignment of contacts. Be sure no bushings are cracked or broken.

General

Check the condition of the gaskets; see that they seal the tanks to prevent entrance of water or leakage of oil.

Check the oil valves to see that they do not leak.

Before replacing any pipe plugs or piping that may have been removed during the inspection, clean the threads thoroughly and coat with quick-drying varnish, screwing the parts into place while the varnish is still wet.

Examine all painted surfaces of oil tanks, housings, etc. Any damaged, scarred, or scratched places should be repainted to avoid corrosion.

Troubles and Their Remedies

It is impracticable to give in detail rules for carrying out all the remedies given. Such information must be obtained from the manufacturers' instruction books.

Trouble	Cause	Remedy
Overheating	Poor condition of contacts:	
	(1) Out of proper alignment and adjustment	(1) Dress contacts and adjust properly
	(2) Burned and pitted, due to lack of attention after many heavy operations, or too frequent operation	(2) Dress burned and pitted contacts if practical, or replace with new parts. (High-pressure butt-type contacts usually do not require dressing. Silver-to-silver contacts should be dressed very carefully and only when they actually require it)
	(3) Breaker kept closed or open for too long a period (copper contacts)	(3) Operate breaker more frequently to wipe contacts clean. It may be advisable to install silver-to-silver contacts. Consult the manufacturer (*Continued on page 152*)

When You Can't Buy 'em *BIG*—Buy 'em *GOOD!*

REALLY, it's no hardship when you have to buy smaller motors. *You save money.* But remember, when you can't buy 'em big—buy 'em good.

Now that you cannot depend on oversize to take your motors through tough service—you must depend on quality.

That is why you should investigate Fairbanks-Morse Motors with *Copperspun* Rotors.

The winding of the *Copperspun* Rotor is centrifugally cast of COPPER in one piece. It provides electrical and thermal characteristics that give this motor the stamina to stand up under the most severe service without mechanical failure. You can operate a Fairbanks-Morse Motor with *Copperspun* Rotor at its full rated capacity continuously and indefinitely without fear of damage from overloading.

Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.

Copperspun

FAIRBANKS-MORSE

DIESEL ENGINES
PUMPS
ELECTRICAL MACHINERY
SCALES
MOTORS

WATER SYSTEMS
FARM EQUIPMENT
STOKERS
AIR CONDITIONERS
RAILROAD EQUIPMENT

F M

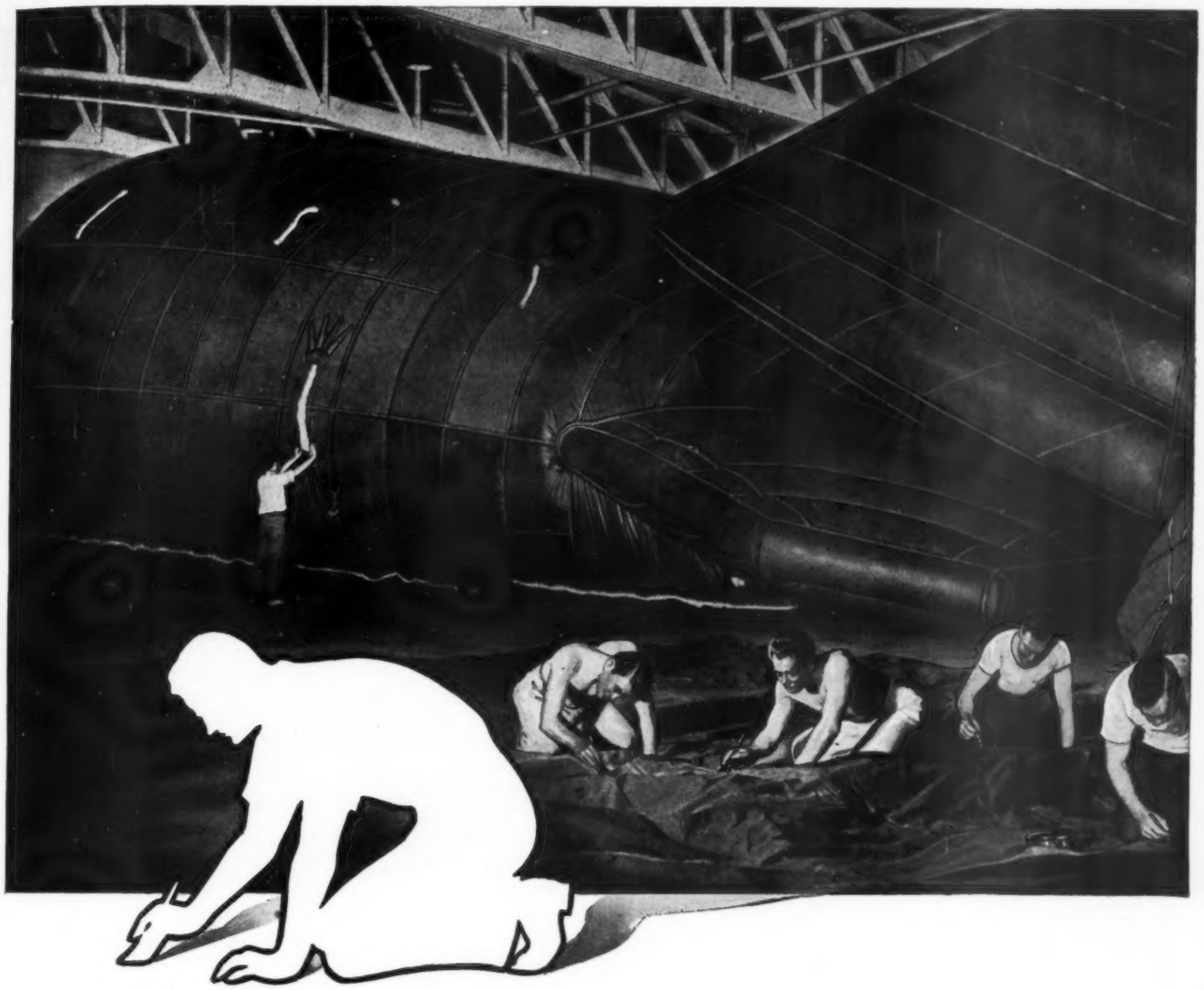
Motors

Power Circuit Breaker Upkeep and Trouble Shooting (*Continued from Page 150*)

Troubles and Their Remedies *(Continued)*

Trouble	Cause	Remedy
Overheating—(Cont.)	Overloading (continuous or prolonged current in excess of breaker rating)	If the breaker is overheating because of excess current one of two remedies can be adopted: (1) Replace with a breaker of rating adequate for the present or future load (2) Arrange circuits to remove the excess load
	Transmission of heat to breaker from overheated or inadequate cables or connection bars	If the bars or cables overheat because of current in excess of their capacity: (1) Increase the carrying capacity by increasing the number or size of conductors (2) Remove excess current from circuit
	Loose connections or terminal connectors	Tighten
	Location in too hot an ambient or in improperly ventilated location	Relocate in a cooler place or arrange some means of cooling
Failure to trip	Mechanism binding or sticking because of:	
	Lack of lubrication	Lubricate mechanism
	Need for adjustment	Adjust all mechanical devices, such as toggles, stops, buffers, opening springs, etc., to manufacturers' specifications
	Failure of latching device	Examine surface of latch. If worn or corroded it should be replaced. Check latch wipe and adjust to manufacturers' specifications
	Damaged trip coil	Replace damaged coil
	Blown fuse in control circuit (where trip coils are potential coils)	Replace blown fuse
	Faulty connections (loose or broken wire) in trip circuit	Repair faulty wiring, see that all binding screws are tight
	Damaged or dirty contacts of tripping device	Dress, replace, or clean tripping device contacts
Failure to close, or to latch closed	Mechanism binding or sticking because of:	
	(1) Lack of lubrication	(1) Lubricate mechanism
	(2) Improper adjustment of breaker mechanism	(2) Adjust all mechanical devices, such as toggles, stops, buffers, opening springs, etc., to manufacturers' specifications Check stroke (opening and closing) and adjust according to manufacturers' specifications
	Burnout of operating coil (of electrically operated breaker) due to:	Replace defective coil and
	(1) Operator holding control switch closed too long	(1) Educate operator how to operate properly. A better remedy would be to change the connections to include an auxiliary switch automatically to cutoff the closing source as soon as the breaker closes
	(2) Closing relay sticking	(2) Check or adjust closing relays

(*Continued on page 154*)



THE MISSING MAN

A million men are NOT working today because of illness

PICTURE all American industry stopped one week this year. You'd see, in a dramatic way, the enormous price we now pay for illness. And over half of this loss is due to the common cold and its complications.

These figures are based on reports of the U. S. Public Health Service and other reliable sources.

Absences were reduced in 92% of the companies which established health programs, it was shown in the Industrial Health Practices survey of the National Association of Manufacturers. Soap, hot water and individual tissue towels discourage the spread of illness.

Perhaps your workers now have the safeguard of ScotTissue Towels. In this case, enlist their help in preventing waste. Then more workers can enjoy the benefits of these towels.

Join the Scott WAR ON WASTE

The Scott Washroom Advisory Service has helped certain firms to cut waste of towels up to 30%. Through our posters and other means, employees are encouraged to use only *one* towel at a time.

Actually, one "Soft-Tuff" towel will absorb twice the water normally left on hands after washing. It has ten times the rub strength of previous ScotTissue Towels, though soft as ever.

Other washroom economies have also been effected in many cases.

For further information, write Scott Paper Co., Chester, Pa.

"SOFT-TUFF" Scot Tissue TOWELS

Stay Tough When Wet

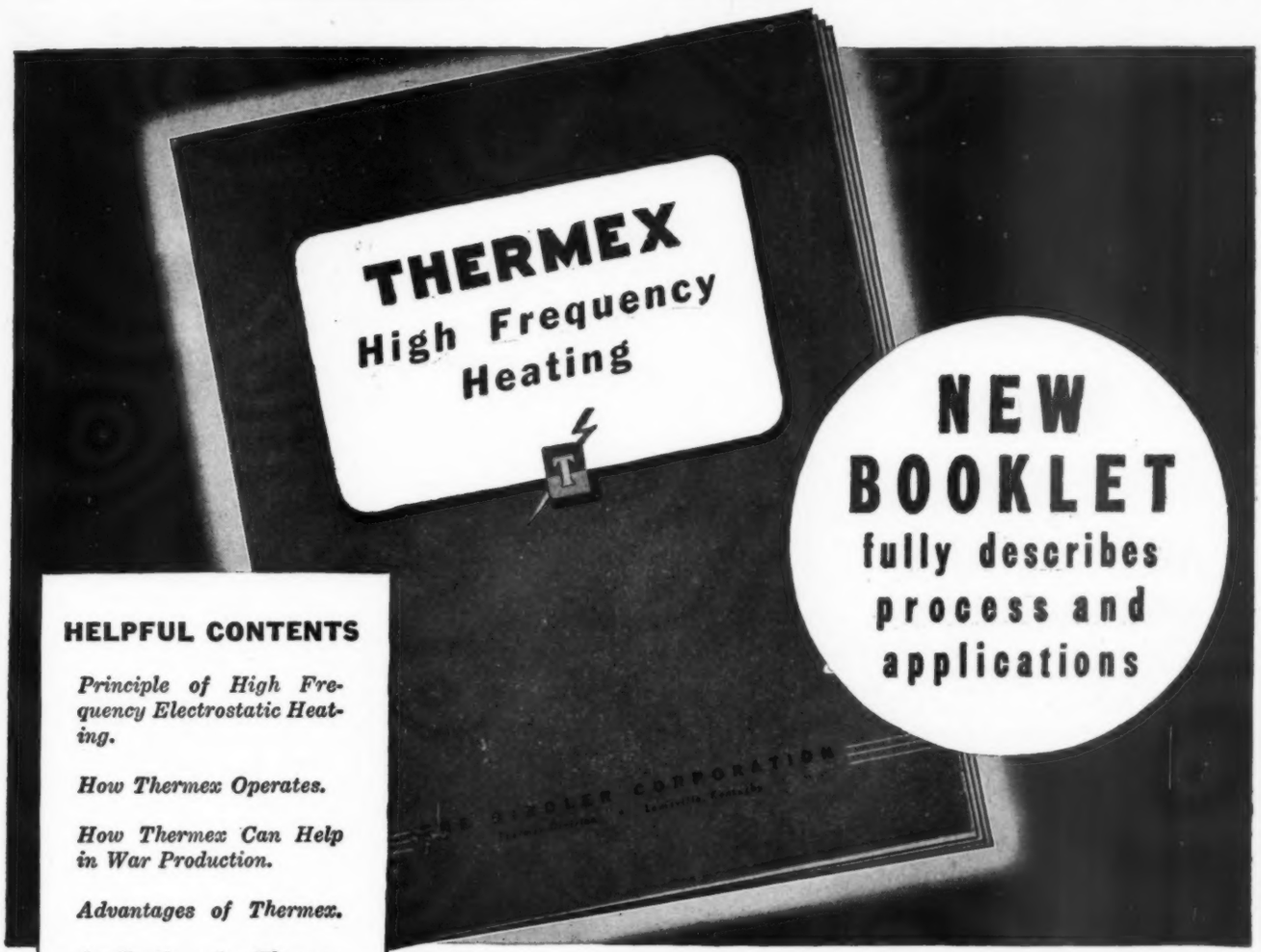
Trade Marks "ScotTissue," "Soft-Tuff," "Washroom Advisory Service" Reg. U. S. Pat. Off.

Power Circuit Breaker Upkeep and Trouble Shooting *(Concluded)*

Troubles and Their Remedies *(Concluded)*

Trouble	Cause	Remedy
Failure to close, or to latch closed (Cont.)	(3) Cutoff switch operating too soon	(3) Delay closing of cutoff device to allow breaker to close fully
	(4) Cutoff switch operating too late, causing breaker to "bounce" open	(4) Readjust to reduce power at end of stroke and eliminate bounce
	Insufficient control voltage (of electrically operated breaker) caused by:	
	(1) Too much drop in leads	(1) Install larger wire, improve contact at connections
	(2) On a.c. control—poor regulation	(2) Install larger control transformer. Check rectifier and be sure it is delivering adequate d.c. voltage from adequate a.c. supply
	(3) D.c. control—battery not fully charged or in poor condition	(3) Give battery a sustaining charge, or repair according to manufacturers' instructions
	Blown fuse in control circuit (electrically operated breaker)	Replace blown fuse
	Faulty connection (loose or broken wire) in control wiring	Repair faulty wiring, tighten all binding screws
	Damaged contacts in control switch (electrically operated breaker)	Dress or replace damaged contacts in control switch
Insufficient oil (in oil circuit breaker tanks)	Leakage of oil	Ascertain points of leakage and repair. Tighten up joints in oil lines
	Oil throw during operation	Fill to proper oil level
		If oil has been lost, replace with the proper quantity of new oil. Be sure oil of proper dielectric strength (not less than 22 kv. test for new oil) is put in. A modern breaker does not usually throw oil when interrupting current within its rating
Dirty oil	Carbonization from many operations	Drain and filter or replace with new oil. Clean all internal parts of breaker
Moisture present in oil	Condensation of moist atmosphere	Drain and filter or put in new oil
	Entrance of water from rain or other source	Repair source of water entrance
Sludging of oil	Overheating	Filter or put in new oil. Remove cause of overheating
Gaskets leaking	Improper installation of gasket at a previous inspection or repair	Put in new gaskets, treated in accordance with the manufacturers' instructions
	Oil saturation	
Insulation failure	Absorption of moisture, accumulation of dirt, grime, or carbon on bushings and insulated parts	Thoroughly clean all insulated parts
		Bake or dry out water-soaked parts (or treat according to manufacturers' instructions)

Dry, heat process or bond non-conducting materials uniformly and rapidly with Thermex!



HELPFUL CONTENTS

Principle of High Frequency Electrostatic Heating.

How Thermex Operates.

How Thermex Can Help in War Production.

Advantages of Thermex.

Applications for Thermex

Power Flow Diagram of Thermex.

Thermex high frequency electrostatic equipment simply applies the principle involved in generating heat by molecular friction. That is, heat may be generated *within* a material by subjecting it to an electrostatic field. Thermex is the first practical, proved equipment for commercial uses.

Rapid, uniform heating regardless of thickness!

The advantages of high frequency electrostatic heating are many. First, practically any *non-conducting* material may be heated. Second, heating is *uniform* throughout, and is generated at a *rate* never before attained. Other values of Thermex are listed at the right.

To help you visualize the possible applications of high frequency electrostatic heating to your operations, we invite you to write for a new booklet fully describing Thermex and its many uses. Mail the convenient coupon *now!*

• A few advantages of Thermex high frequency electrostatic heating equipment:

Uniform heating throughout. Speed of heating never before attained. Applies to all non-metallic materials. No redistribution of moisture. Less handling required. Reduces labor costs. Handles wide variety of jobs with high efficiency. Results may be reproduced without variation. No surface damage or danger of overheating. Heating may be suspended immediately. No "hot plates" or steam required. Wide range of sizes for all requirements.

MAIL THIS CONVENIENT COUPON

THE GIRDLER CORPORATION
Thermex Division
217 E. Broadway, Louisville, Ky.
Send us your free booklet on Thermex High Frequency Heating:

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Address_____

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The **GIRDLER CORPORATION**
Thermex High Frequency Electrostatic Heating Equipment
THERMEX DIVISION . LOUISVILLE, KENTUCKY

A MIGHTY flood of "Chicago pianos"...

Fire-power to engulf the Axis . . .

Machine guns by the million . . .

That is America's promise to the Victory Program—and America is going to beat that promise.

The time-table of war construction has been reviewed in order to get essential new plants into production without delay.

Heating problems presented by plant conversion and by the new building program call for a proven method of heat distribution.

When steam is selected as the heating medium, all of the experimenting has been done. Steam harnessed and brought under control with Webster Systems of Steam Heating has proved its ability to heat every section of a building to the desired temperature at minimum cost.

Today, we are engaged in direct war work, but manufacturing facilities are still available to supply Webster Steam Heating Equipment for buildings serving the war effort.

Essential repairs for Webster Systems are available on A-10 priority, under W.P.B. Emergency Repair Order P-84. Orders should be limited to actual needs.

Warren Webster & Company, Camden, N. J.
Representatives in 60 principal Cities

Webster
Steam Heating

YOU WANT TO KNOW

more about the items mentioned on this page

Letters to the addresses given will bring information

• BETTER BUMP ABSORPTION is claimed for "Floating Hub" shock absorbing wheels now on the market as substitute for precious rubber wheels of large caster type. The load is carried off center, allowing the wheel to ride bumps without lifting the load. Bassick Co., Bridgeport.

• TELL-BOARD bulletin display cabinet with glass front keeps the posters and announcements clean and dry. Illumination of the cabinet makes the bulletin board an easy-to-read, bright spot in the plant. Quickly changed. Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pittsburgh.

• IF YOU ARE FACED with the problem of re-negotiating government contracts, a timely aid has been worked out by The Eddy-Rucker-Nickels Company, Cambridge. A paper on "Simplified Pricing Methods," illustrated by a profitgraph and quantity-discount calculator, is available for the busy executive.

• FILM LOAN SERVICE of the University of Iowa Industrial Engineering Film Library of Motion and Time Study Films has recently been enlarged. Available subjects are listed in a 4-page folder. Improved methods for work simplification, methods analysis, job standardization, and related subjects are ready for use in industrial training courses. Bureau of Visual Instruction, Extension Division, University of Iowa, Iowa City.

AUDIO SCALE may mean more war jobs for the blind. Operating on the airplane radio beam principle, the scale signals "A" for underweight, "N" for overweight. Correct weight brings unbroken buzz. Powder for fuses, mica for radio mechanisms, buttons for uniforms can be weighed out in specific amount. Toledo Scale Co., Toledo

• INDUCTION HEATING gets the job of helping to stretch our scanty supply of tin. In one steel mill it is the final step in producing electrolytically tinned sheet steel, which has a coating only one-third as thick as that produced by the hot-dip process. As it comes from the plating bath, the tin coating is dull and rough;

Production will please the pup,
To make him frown, just keep it
PRODUCTION DOWN!
PRODUCTION UP!
"YOUR COUNTRY IS COUNTING ON YOU"
"WE CAN, WE WILL, WE MUST"
Wipe off that smile!

SO SUCCESSFULLY did the Bausch & Lomb production board work in its own plants that this company has made both the board and an accompanying poster available for any other industry at a nominal charge. Both are based on the same idea—that low production will please the Jap, but high output will wipe that grin off his face. Board and poster can be secured, for 60¢, from Bausch & Lomb Optical Co., Rochester, N. Y.

NEW LIFE for SHELL FORGING DIES

SUN LUBRICANTS

Reduce Shutdowns • Increase Die Life • Halve Cost of Lubrication!

Ammunition for the big guns of our fighting men takes top rating in "urgency" . . . and Sun Lubricants are helping many munitions makers to "deliver the goods" ahead of schedule.

About ten months ago, one of the country's largest producers of 75 m.m., 105 m.m. and 155 m.m. high-explosive, armor-piercing shells switched to Sun's Circo XXX Heavy Oil as a die lubricant in the forging operation. The results have been remarkable . . . with die life increased beyond all expectations . . . lubricant costs cut in half . . . and shutdowns, due to failure of dies and piercing points, practically nil.

These shells are forged at high temperature by the standard upsetting and bulldozing methods. Circo XXX Heavy Oil, applied to the dies by swab at intervals of every third forging, burns clean . . . produces no scale that may mar the finish of the forging.

This is but one of thousands of instances in which Sun Oil Engineers and Sun Lubricants are helping Industry to speed the flow of vital war products. Let a Sun "Doctor of Industry" help to speed up your production . . . and cut costs at the same time. He will be glad to study your lubrication problems and make complete recommendations. Write

SUN OIL COMPANY, *Philadelphia*

Sun Oil Company, Limited . . . Toronto, Canada

SUNOCO

SUN PETROLEUM PRODUCTS HELPING INDUSTRY HELP AMERI

2 GRIPS ARE BETTER THAN ONE

HANSEN

PUSH-TITE

HOSE CLAMPS

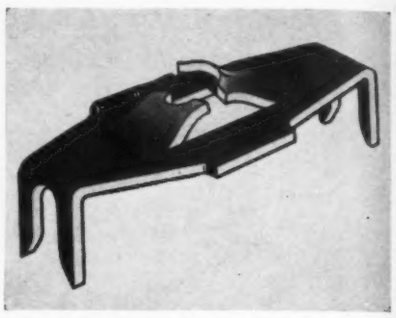
Proof of the facts is in the testing. Hansen compression type hose clamps have proven in actual laboratory tests that they will take over 5000 lbs. pressure and we recommend a safe working pressure from 800 to 1000 lbs. With Hansen hose clamps it's two grips, one on inside of hose, one on outside, as compared with only one grip found in ordinary hose clamps. Extremely easy to install it's merely a matter of screwing stem into hose, takes but a few seconds. No extra parts or replacements and remember they're very economical . . . can be used many times over. With Hansen hose clamps it's a two to one advantage. Send for free catalog.

Hansen MFG. CO.

INDUSTRIAL *Air Line* EQUIPMENT

1786 EAST 27TH STREET . . . . CLEVELAND, OHIO

by passing the strip through a recently developed inductor heater coil, the tin is heated to the fusing point and forms a bright, shiny surface. Westinghouse Electric & Manufacturing Co., E. Pittsburgh.



SELF-LOCKING SPEED NUT saves both time and weight in the assembly of plywood parts. When driven into thick plywood the attaching legs are forced outward in a firm grip. On thin plywood the attaching legs peen over when driven against a backing plate. Weigh only 3½ pounds per thousand. Tinnerman Products, Inc., 2096 Fulton Rd., Cleveland

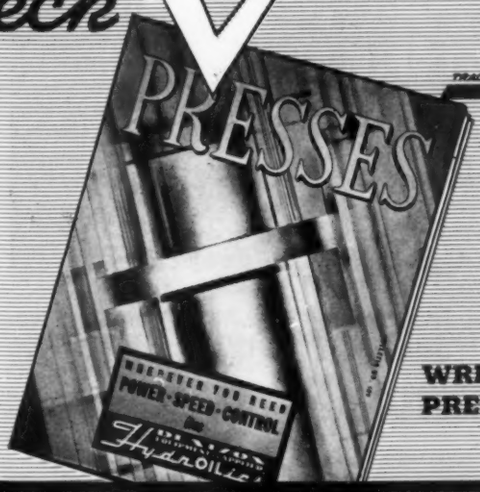
• CHART "Controlled Materials Plan" gives a detailed picture of War Production Board's method of controlling the flow of critical materials into war production. Presented in December issue of FACTORY, 330 W. 42nd St., New York, it is available at 50c.

• GLOW IN THE DARK shows flaws in metal after the application of fluorescent substances. Magnaglo, in paste form, finds the flaws in magnetized or magnetic metals. Zyglo, a liquid, discloses below-surface defects in nonferrous metals. Scratches and surface irregularities are not shown. Magnaflux Corp., 5908 N.N.W. Highway, Chicago.

QUICK BRUSH-OFF for metal cavities. "Sibot" brush cleans sides and bottom simultaneously, leaving metal holes and recesses free of rust, scale, dirt, chips. Dusting can be done by hand or by inserting into the chuck of a drill press as shown. Osborn Manufacturing Co., 5401 Hamilton Ave., Cleveland

... FOR POSITIONING.

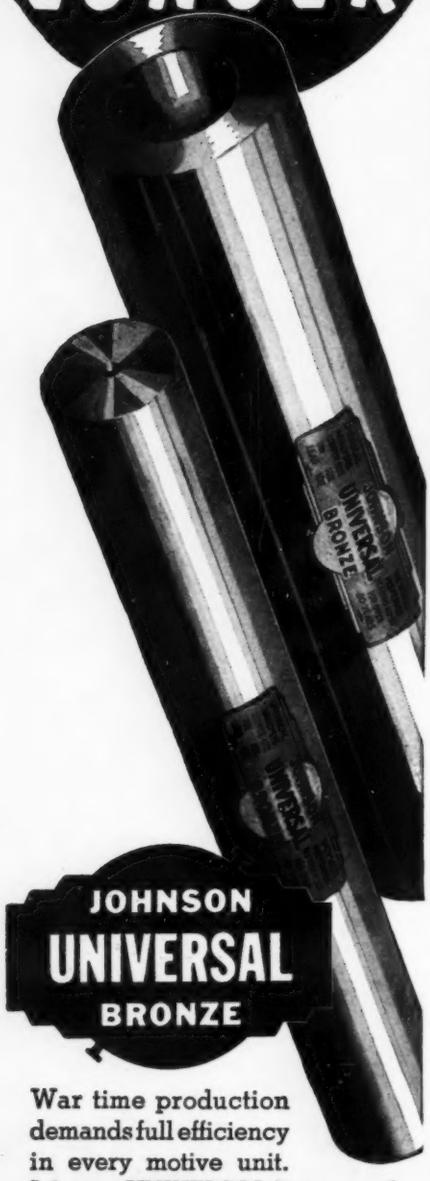
Check ✓



DENISON
EQUIPMENT in APPLIED
TRADE-MARK Hydrolics

WRITE FOR THIS NEW
PRESS CATALOG TODAY

KEEP WHEELS TURNING FASTER LONGER



JOHNSON
UNIVERSAL
BRONZE

War time production demands full efficiency in every motive unit. Johnson UNIVERSAL Bronze will help you get the most from your bearings... cut replacements to a minimum . . . keep wheels turning FASTER . . . LONGER. Your local distributor carries a complete stock.

JOHNSON BRONZE
512 SOUTH MILL STREET
NEW CASTLE, PA.

WHAT'S NEW IN EQUIPMENT

Portable Turnstile

Designed especially for war plant service for better gate protection, the portable

turnstile can be set up any place. It needs no anchors. Removable chains close off gaps compelling passage through the arms of the stile. Between shifts the stile can be rolled away, allowing truck passage. Super-Kompak is available with foot-pedal control for the gate guard or in token-controlled models operated by employees' time disks. Two-way or one-way passage can be supplied. Automatic registers for counting employees can be added. Percy Manufacturing Co., Inc., 101 Park Ave., New York.

Graphite Lubricant

Lubricant for the dead centers of lathes is a combination of flake lubricating graphite and other ingredients. Withstands the high pressures and temperatures developed at the dead center. It is claimed that this lubricant controls overheating and protects dead centers against scoring and softening. Product has many uses as an anti-seize compound where a lubricant of extreme film strength is required. It is sold in 1-, 4-, and 8-oz. collapsible tubes. Joseph Dixon Crucible Co., Wayne and Monmouth Sts., Jersey City, N. J.

Electrical Insulation

Three insulating alternates for varnished silk are now available. Varnished rayon, varnished cotton cloth, and varnished nylon have been developed for electrical insulation formerly provided by varnished silk. These materials are believed to possess dielectric strength with tensile and and tear strengths equal to or better than varnished silk and can be punched into special shapes. They are available in thicknesses from 0.003 to 0.008 inch in straight cut rolls or bias cut strips in 51-in. lengths. Each base material is coated with special insulating varnish and has a dielectric strength of 1200 volts per mil. Irvington Varnish & Insulator Co., Irvington, N. J.

Welding Machine Starter

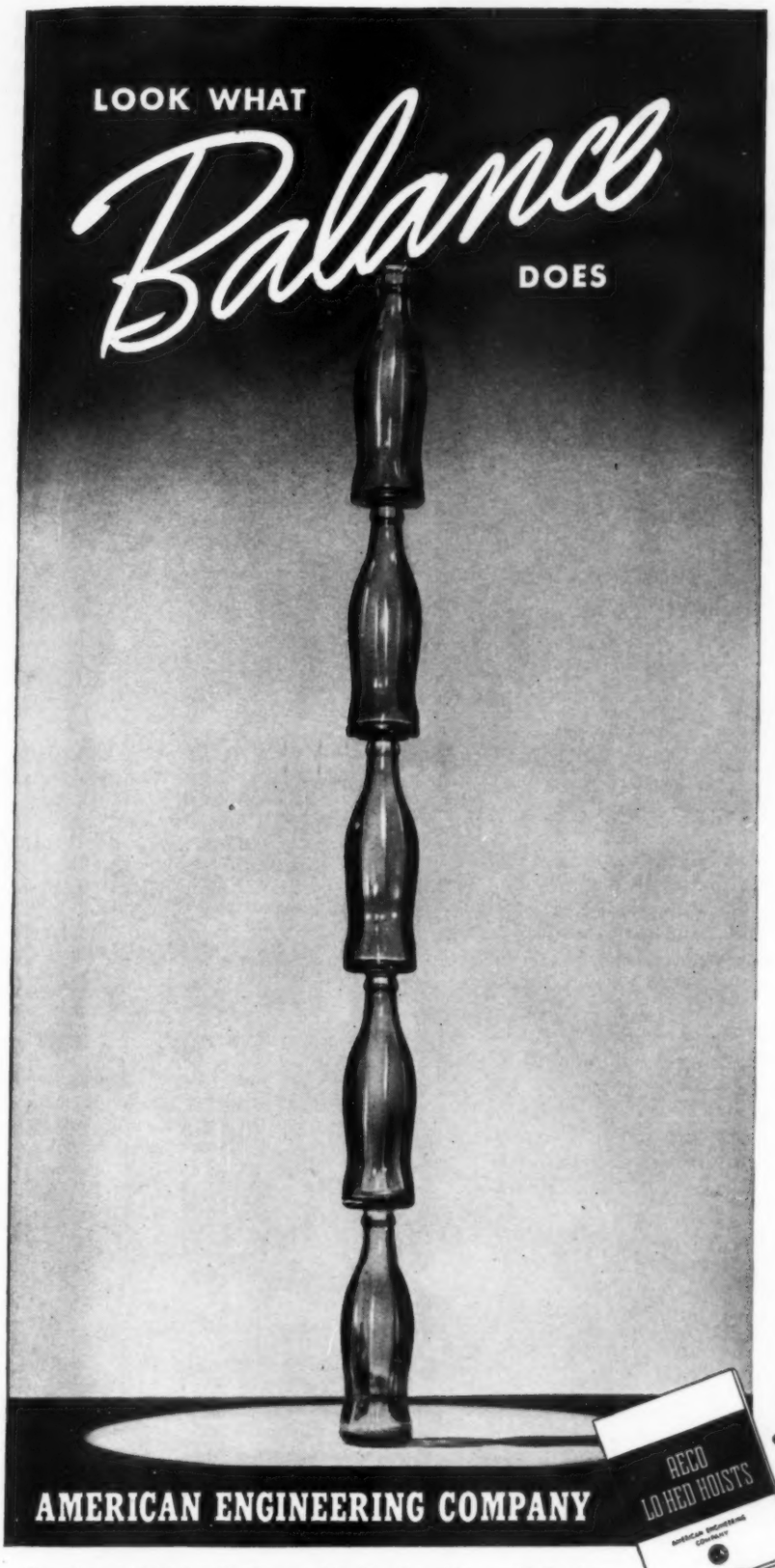
Automatic welding machine starter with arc-time totalizer, -hp- model 1010, is designed to operate in conjunction with any standard welding motor-generator set. It starts the welding machine when the welder touches the rod to the work. After a short period of no welding, the control automatically stops the machine, releasing power for other machines. The arc-time totalizer, operating during welding, keeps a record of actual arc-time. Hewlett Packard Co., 395 Page Mill Rd., Palo Alto, Calif.

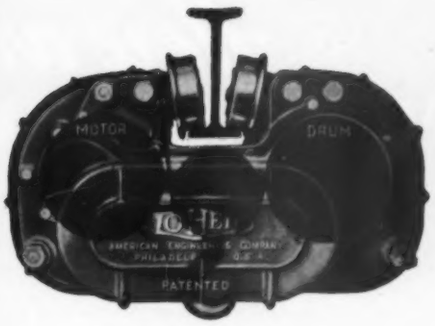
Woman's Protective Clothing

Complete line of tailored protective clothing for women welders is announced. Made of chrome tanned cowhide, clothing is light in weight, yet gives protection against flying sparks.

These safety garments are cut to afford free and easy movement of the body, but fit so snugly that there are no gaps or open-

ings. Line consists of cap, short jacket, coat, overalls, sleeves, and a 36-in. apron. Welted inseam construction is used for





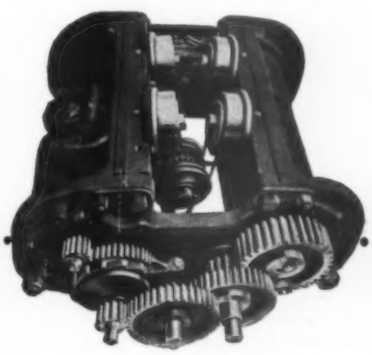
Look what BALANCE does in an electric hoist

Looking for an electric hoist that will give you years of satisfactory service after the war? Then take a look at the balanced construction of the Lo-Hed hoist—motor and drum arranged on opposite sides of the beam.

This unique construction gives you minimum headroom—a desirable plus feature for which you pay no premium. Balanced construction means much to you in dollars and reliability.

Because of balanced construction, the Lo-Hed hoist can use an efficient all-spur gear drive (sealed in oil), husky, short shafts for greater torsional strength, easily removable covers.

Along with these Lo-Hed features is everything else you want in an electric hoist—heavy duty hoist motor, ball or roller bearings, automatic holding brake, 100% positive automatic upper limit stop, fire, dust and moisture proof controller, and precision machining. Buy the hoist that will last longer—Lo-Hed. Ask for the complete catalog of Lo-Hed Hoists.



The Lo-Hed Hoist Is Applicable To Any Monorail System
There's A Balanced Lo-Hed Electric Hoist For Every Purpose

•

Look in your Classified Telephone Directory under "A-E-CO LO-HED HOISTS" for your nearest representative

•

OTHER A-E-CO PRODUCTS: **TAYLOR STOKERS, MARINE DECK AUXILIARIES, HELE-SHAW FLUID POWER**

AMERICAN ENGINEERING COMPANY
2426 Aramingo Avenue, Philadelphia, Penna.

☐ Please send me your complete catalog of LO-HED HOISTS
☐ Ask your representative to get in touch with me promptly

Name_____

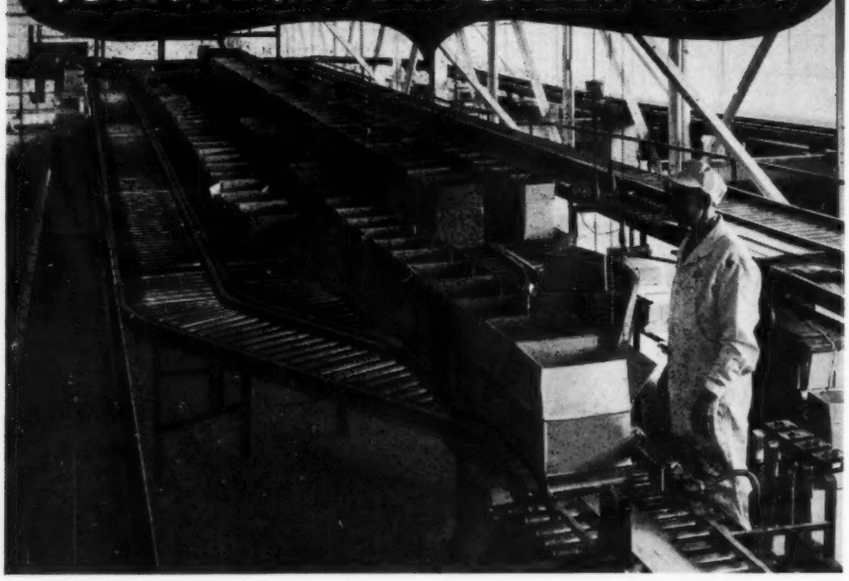
Company_____

Street Address_____

City_____ State_____

(Please Print Plainly)

Here are Two "POST-WAR MIRACLES" YOUR PLANT CAN ENJOY NOW!



This A-F Scientifically Designed Conveying System accumulates various size cartons from all parts of the plant, assorts them into sizes and transports "trains" of proper sizes to sealing machines.

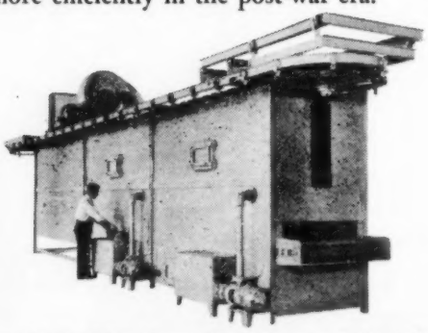
MANY of the new "scientific miracles" will not be available *to the public* until this war is won.

But we, at Alvey-Ferguson, are producing conveying equipment and metal products cleaning machines for plants which are helping America win this war—and we've thrown the calendar away!

A-F conveying equipment and metal products cleaning machines have been scientifically designed and especially engineered to not only speed up production of war materials *now* but, with few or no changes, will help plants produce more efficiently in the post-war era.

If you have an "indoor transportation" problem or metal products cleaning or degreasing problem that only a "post-war miracle" can properly solve—write us at once and we'll help you solve it now!

THE ALVEY-FERGUSON CO.
131 Disney Street Cincinnati, Ohio



VALUABLE floor space is saved by this "Siamese-Twin" A-F Machine which combines two different complete wash, rinse and dry units in the same housing.

CONVEYING A-F MACHINERY

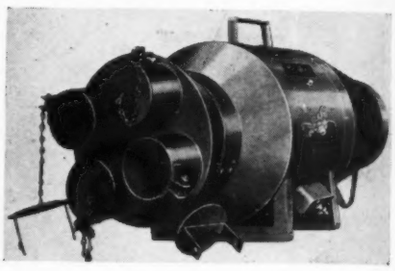
ALVEY-FERGUSON Conveyors

AND PRODUCTS WASHING MACHINES

strength and to protect the stitching from hot sparks. Leather cap, shaped somewhat like a bathing cap, with flaps extending over the ears, is fashioned to cover the hair and hold it in place. Overalls are styled like women's slacks. Flared trouser legs provide additional protection for the feet. Yoked backs of coat and short jacket permit freedom of arm movement. Tucks provide ample fullness and flexibility at the bust. Sleeves are shaped to fit and permit easy arm movement. American Optical Co., Southbridge, Mass.

Exhauster and Blower

Introducing "Octopus Jr." A small portable unit is now on the market to eliminate gases and fumes from closed-in



places such as shipholds, welding rooms, tunnels, vaults, and basements. Powered by a ¾-hp. ball-bearing motor, it sucks or blows 2000 c.f.m. The unit operates in any position and weighs but 70 pounds. Has adapters for three 4-in. nozzles or four 3-in. nozzles for flexible hose. Each 4-in. metal hose of 20-ft. length will exhaust 250 c.f.m., each 3-in. hose over 200 c.f.m. Chelsea Fan & Blower Co., Inc., 1206 Grove St., Irvington, N. J.

Multi-Contact Timers

Automatic timer controls sequence operations of a single or a multiple number of electrical circuits. Has self-starting synchronous motor, gear train operating in oil, and plastic cams mounted in identical pairs. Cams can be adjusted to give desired sequence. Contacts are visible. Can be furnished with momentary starter. The R. W. Cramer Co. Inc., Centerbrook, Conn.

Trucks

Available in lift, cargo, and tractor types, Salsbury Turret Trucks have a fully automatic clutch and self-shifting transmission. Unusual maneuverability is claimed in the

BIG PUSH

As the big push of production surges forward in the frontiers of America's industrial plants—horsepower is always on the offensive.

And in these great industrial plants—over 100,000 strong—Dayton V-Belts are on the job night and day, *every day*, transmitting smooth-flowing power for every phase of war production from raw materials to finished munitions and materiel.

Saving precious time—protecting priceless machinery—cutting power losses and reducing maintenance to a negligible minimum—these are just a few of the conservation services delivered by long life Dayton V-Belts despite relentless wartime service conditions.

Operating on short centers, these strong, flexible, built-to-bend Daytons are cool-running and firm gripping. So they assure closer speed control while permitting the operation of more high-speed machinery per square foot of floor space.

Located nearby to serve your wartime needs is a Dayton Distributor whose stock of V-Belts is supplemented by strategically located factory warehouses. So for service—or for helpful suggestions regarding the conservation of V-Belts through proper application and maintenance procedure—call your nearest Dayton Distributor.

THE DAYTON RUBBER MFG. CO.
The World's Largest Manufacturer of V-Belts
DAYTON, OHIO

DAYTON RUBBER EXPORT CORPORATION
38 Pearl Street, New York, N. Y. U. S. A.

THROW YOUR SCRAP INTO THE FIGHT!
BUY WAR BONDS AND SAVINGS STAMPS

Dayton V Belts
LIFELINES OF POWER — VITAL TO VICTORY

THE GREATEST NAME IN V-BELTS

Copyright, 1943, The Dayton Rubber Manufacturing Co.

THIS LITTLE PLUG BUILT A BIG BUSINESS

Remember the first "talkies"? The booming, crackling sound was about all you could remember.

Tremendous improvements were made within the first year in recording sound and one of those improvements was the development of a Cannon Connector for use in the recording circuit.

Those first Cannon Connectors or Plugs were built to take a great deal of abuse and at the same time they were machined so accurately that they could be connected or disconnected instantly, and when connected they gave a continuous, unbroken flow of current always.

CANNON SERVES MANY INDUSTRIES

Cannon still makes plugs for sound recording, but from those first plugs came the standard Cannon Plugs which are used in radio, television, aircraft and in many other places where an absolutely continuous flow of current is needed and where servicing and repairs demand an instantaneous connect or disconnect.

CANNON ELECTRIC

CANNON ELECTRIC

Cannon Electric Development Company

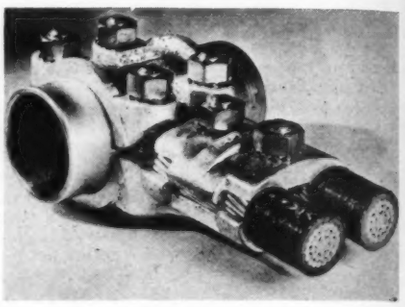
Los Angeles, California

Canadian Factory and Engineering Office: Cannon Electric Company, Limited, Toronto, Canada

engine-over-drivewheel power assembly contained within a turret. The main frame of the power plant is mounted in ball bearings, which permits steering in any direction over a 360-deg. arc. The turret is removable for servicing. Power plant is a single-cylinder, 4-cycle, air-cooled engine, providing maximum speed of 8 miles per hour, loaded. Nutting Truck & Caster Co., Faribault, Minn.

Power Connector

Power connector, type KTC, is a compact flexible fitting made with 2- or 3-wire branch taps. Takes a wide range of wire



sizes. Interlocking clamp binds all strands in the lug. Hex-head bolts held by recesses in the body of the connector make single wrench installation possible. O. Z. Electrical Mfg. Co., Brooklyn, N. Y.

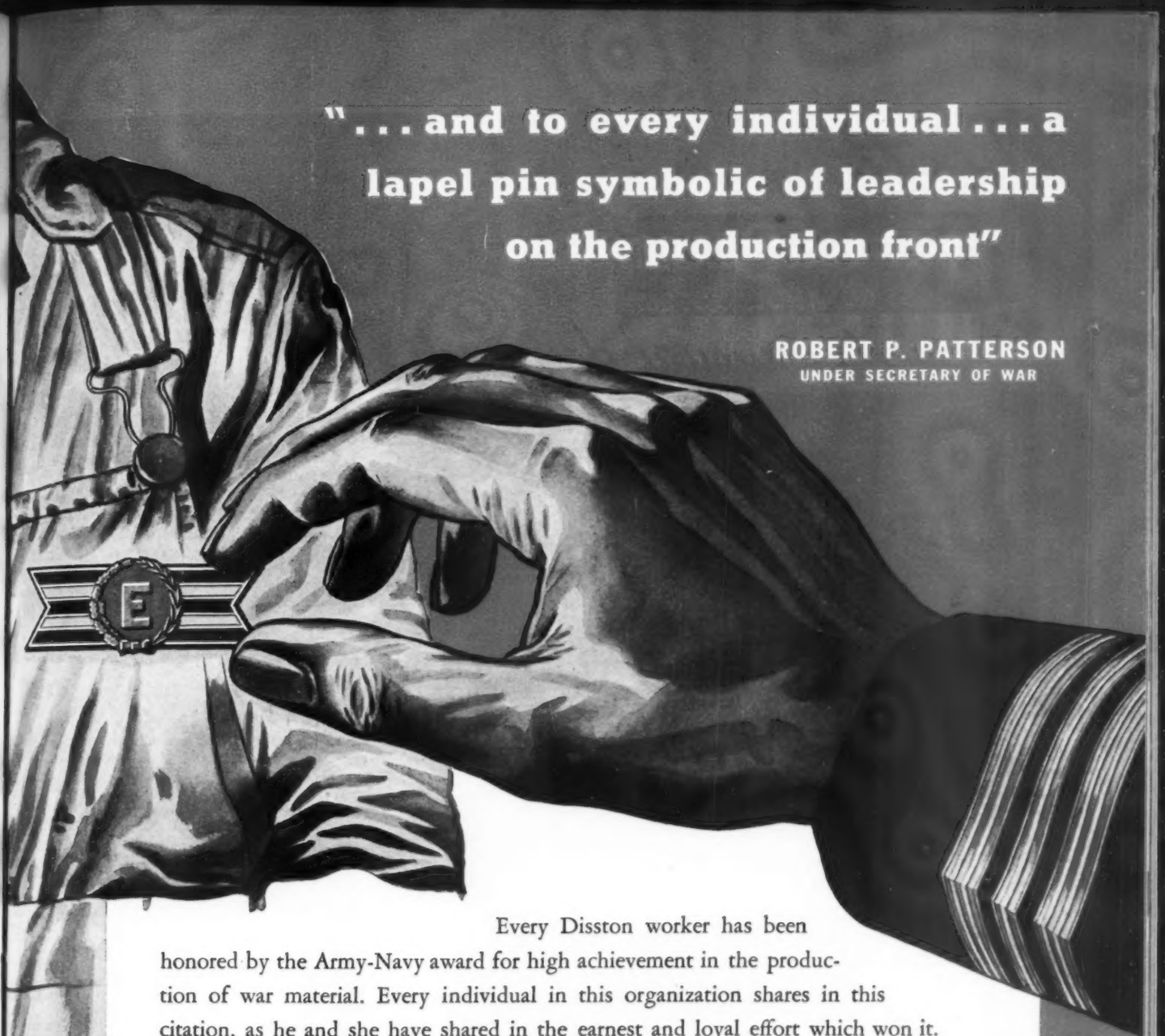
Washable Water Paint

Opaltone comes in eight pastel shades and white, and the addition of oil-resin emulsion makes it washable. Add only water to this concentrated paste paint. It applies easily and one coat is usually sufficient. No primer or sealer is required and Opaltone will cover wallboard, concrete block, brick, plaster, wallpaper, and painted surfaces. No odor. Truscon Laboratories, Detroit.

A.C. Welding Machine

Transformer type welding machine, called Bumble Bee, operates at open circuit voltage of 42 volts, automatically maintained

by two primary coils and a magnetic contactor in the circuit of one coil. When machine is idle one primary is cut out;


"...and to every individual...a lapel pin symbolic of leadership on the production front"
ROBERT P. PATTERSON
UNDER SECRETARY OF WAR
E

Every Disston worker has been honored by the Army-Navy award for high achievement in the production of war material. Every individual in this organization shares in this citation, as he and she have shared in the earnest and loyal effort which won it.

In announcing the award the War Department says: "To the men and women or the Tacony plant of Henry Disston & Sons, Inc.:—Your patriotism as shown by your remarkable production record is helping our country along the road to victory...congratulations for accomplishing more than seemed reasonable or possible a year ago."

The "E" burgee that flies above the Disston plant and the "E" badge that Disston men and women wear are more than symbols of a year's accomplishment—they are an inspiration to achieve *more*, an incentive to keep on producing beyond what seems "possible."

584
former Disston employees are serving with the armed forces

HENRY DISSTON & SONS, INC.
Tacony, Philadelphia, Pa., U. S. A.

ESTABLISHED 1840

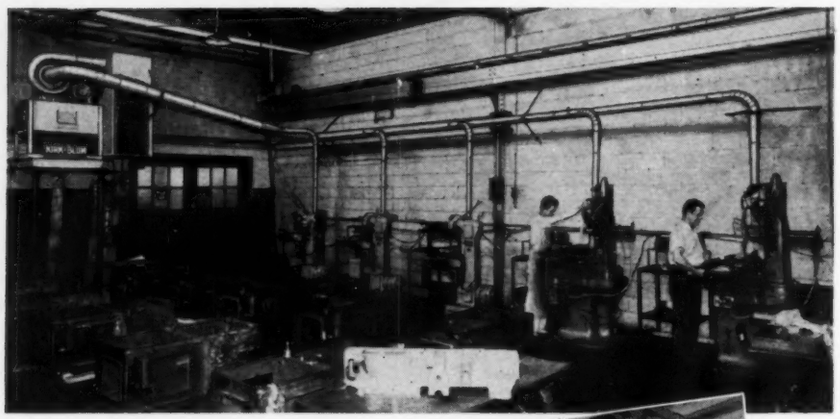
ARMY E NAVY

Disston workers are producing to the utmost of their ability: Armor Plate for the Air Corps and Army motorized equipment... Steel for Ordnance—37 mm. guns, Steel for torpedo and rifle parts... Motor driven chain saws for Army Engineers... Jungle Knives for the Quartermaster Department... Huge quantities of saws, files and other tools for other government departments as well as for thousands of industrial plants making products essential to victory... at the same time Disston workers are producing the Company's regular products for the essential needs of customers.

Another

KIRK & BLUM
DUST CONTROL SYSTEM

meets unusual demands



"We must have silence as well as efficiency in the operation of an exhaust system," — a manufacturer of various types of gauges told us. "Our skilled craftsmen operating small magnetic chuck-type grinders must hear the grinding wheel in contact with gauge block." Here was an unusual demand and Kirk & Blum met it, using Roto-Clones manufactured by American Air Filter Co. Inc.

We made individual installations for the grinders. The hoods especially designed for maximum flexibility and easy adjustment, reduced sound of operation to a minimum.

A similar installation and a ventilating system were made in the heat treating department. Here outside air, tempered in winter and cooled in summer, is introduced to normalize the temperature.

Consult Kirk & Blum Engineers regarding your dust control and ventilating problems. They will make an unbiased recommendation of the type of air cleaning or filtering medium best suited for each individual installation.

Any of these booklets mailed on request.

"Dust Collecting Systems in Metal Industries"
"Blower Systems for Woodworking Plants"
"Fan Systems for Various Industries"
"Industrial Ovens"
"Cooling Systems for the Glass Industry"
"Data on Kirk & Blum Production Facilities"

THE KIRK & BLUM MANUFACTURING CO.
AN ORGANIZATION OF ENGINEERS AND MECHANICS
2835 SPRING GROVE AVE. CINCINNATI, OHIO

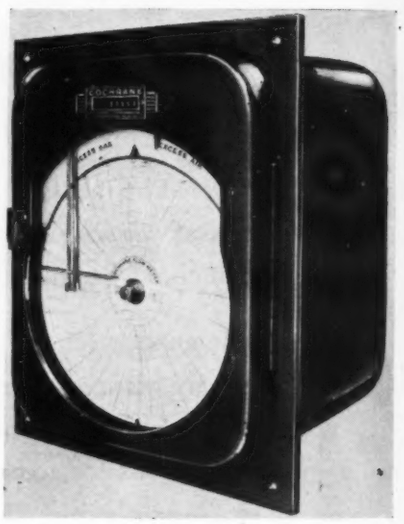
when the electrode contacts the work the second primary is thrown into the circuit. Power factor correction is provided with built-in capacitors on all four sizes—300, 500, 750, and 1000 amperes. Capacitors are cut out when the machine is idle. Unit is portable and 18 inches wide. Connections for either 220 or 440 volts. Single hand wheel control gives current adjustments. Wilson Welder and Metals Co., 60 E. 42nd St., New York.

Angle Drills

A line of "junior" size WYCO angle drilling heads for use on a flexible shaft or flexible shaft extension of a portable electric drill has been designed for production drilling, countersinking, or reaming in close quarters. They come with 90-, 45-, and 30-deg. or universal heads, and have over-all diameters of ½ or ¾ inch. Suitable for use in the assembly of aircraft. Wyzenbeek & Staff, Inc., 836-838 W. Hubbard St., Chicago.

Flow Recorder

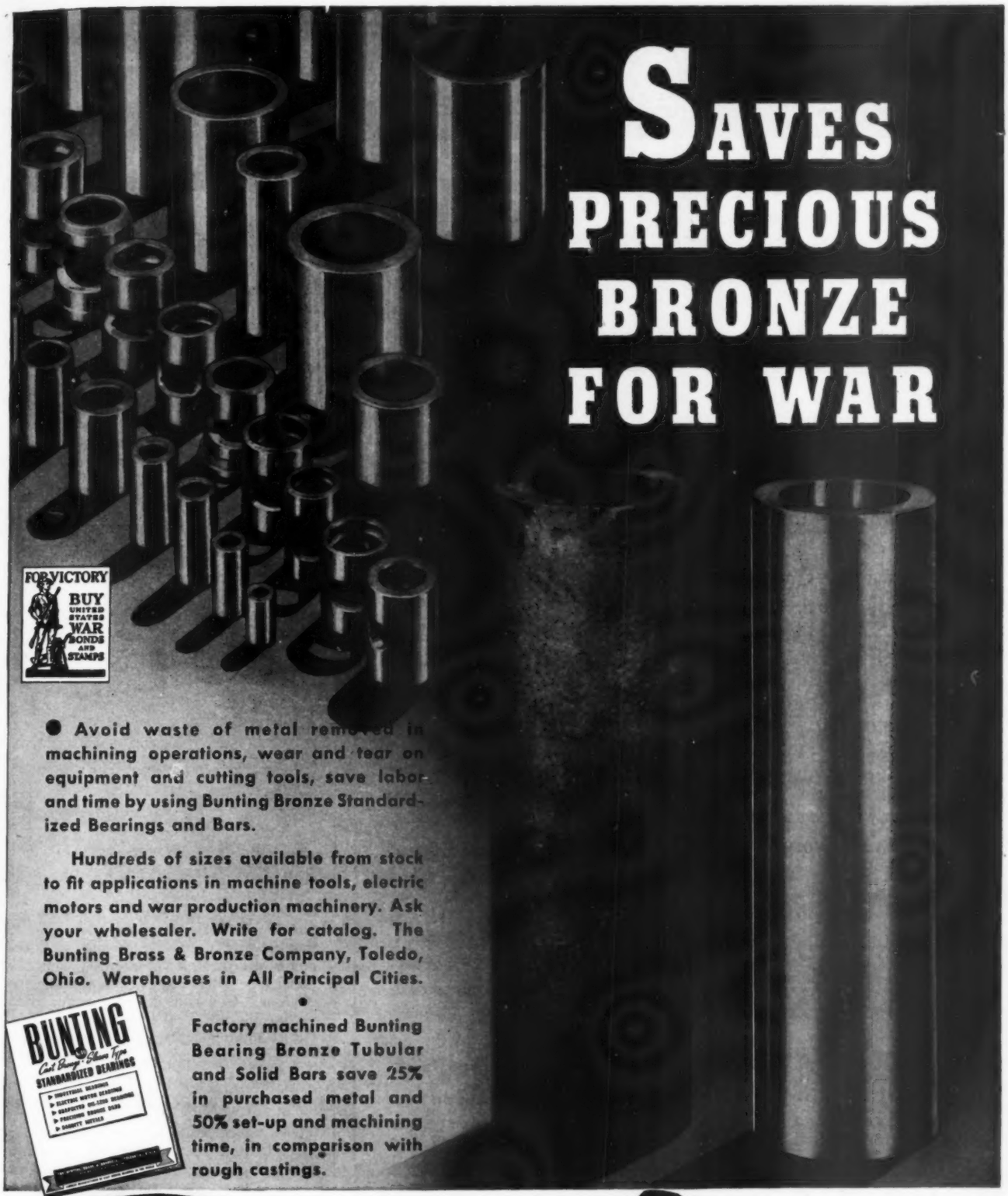
Two-pen electric flow recorder consists of two receivers mounted in a single case and recording on the same chart. Both mechanisms are accessible. Unit can be



furnished with ratio indicating pointer and integrating mechanisms. Pen arm for rear receiver is detachable and has self-aligning junction. Cochrane Corp., 17th & Allegheny Ave., Philadelphia.

Fluorescent Office Unit

Wooden fluorescent lighting unit for office and drafting room, known as the Admiral, is standard in 2-, 3-, 4-, and 6-lamp units and can be secured for continuous runs. Bass-wood louvers provide shielding and are hinged for cleaning and relamping. Side frame and exposed end frame are of walnut-finished birch. All wooden pieces are anchored with metal


SAVES
PRECIOUS
BRONZE
FOR WAR
FOR VICTORY
BUY
UNITED
STATES
WAR
BONDS
AND
STAMPS
● Avoid waste of metal removed in machining operations, wear and tear on equipment and cutting tools, save labor and time by using Bunting Bronze Standardized Bearings and Bars.
Hundreds of sizes available from stock to fit applications in machine tools, electric motors and war production machinery. Ask your wholesaler. Write for catalog. The Bunting Brass & Bronze Company, Toledo, Ohio. Warehouses in All Principal Cities.
•
Factory machined Bunting Bearing Bronze Tubular and Solid Bars save 25% in purchased metal and 50% set-up and machining time, in comparison with rough castings.
BUNTING
STANDARDIZED BEARINGS
Bunting
BRONZE BUSHINGS • BEARINGS • PRECISION BRONZE BARS

Plenty of Endurance for 3 SHIFTS, 7 DAYS a Week!

WITH little care other than an occasional application of Rhoads' belt dressing, Tannate Leather Belts outpull and outlast ordinary belts . . . Grip tight . . . Run smoothly . . . Keep machines at constant high speed, with few shutdowns for maintenance.

Tannate has high overload capacity. It is stronger than most first-quality oak belting. It resists high temperatures, water, machine oil and many chemicals. Pre-stretched, it needs far fewer shutdowns for take-up.

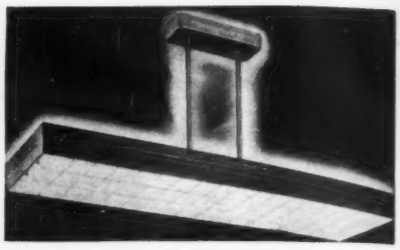
More Production—without more machines

Let Tannate help keep your machines running at top speeds! You'll see production schedules take a turn upward; you'll get more uniform work, less spoilage, fewer shutdowns, reduced unit cost with Tannate. TRY IT!

How to make a long-lived belt last even longer:
Our new folder, "Better Service Belt Hints," tells how best to apply and care for belts . . . is available, free, for all your men concerned with belting.

J. E. RHOADS & SONS • *Established 1702*
35 North Sixth Street, Philadelphia, Pennsylvania
NEW YORK • CHICAGO • ATLANTA • CLEVELAND

STEP UP PRODUCTION with
RHOADS *Tannate*
WATERSHED LEATHER BELTING



pins at the corners and cemented. Reflector is a composition board; there is a V shaped deflector between each pair of lamps. Reflecting surfaces are provided by two coats of baked white synthetic enamel. Wakefield Brass Co., Vermilion, Ohio.

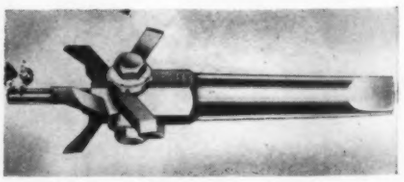
Dust Collecting Bench

A positive downflow of air carries dangerous dust away from the operator into the collecting bench. The air is filtered of all particles and returned to the room, thereby saving heat and fuel. The bench

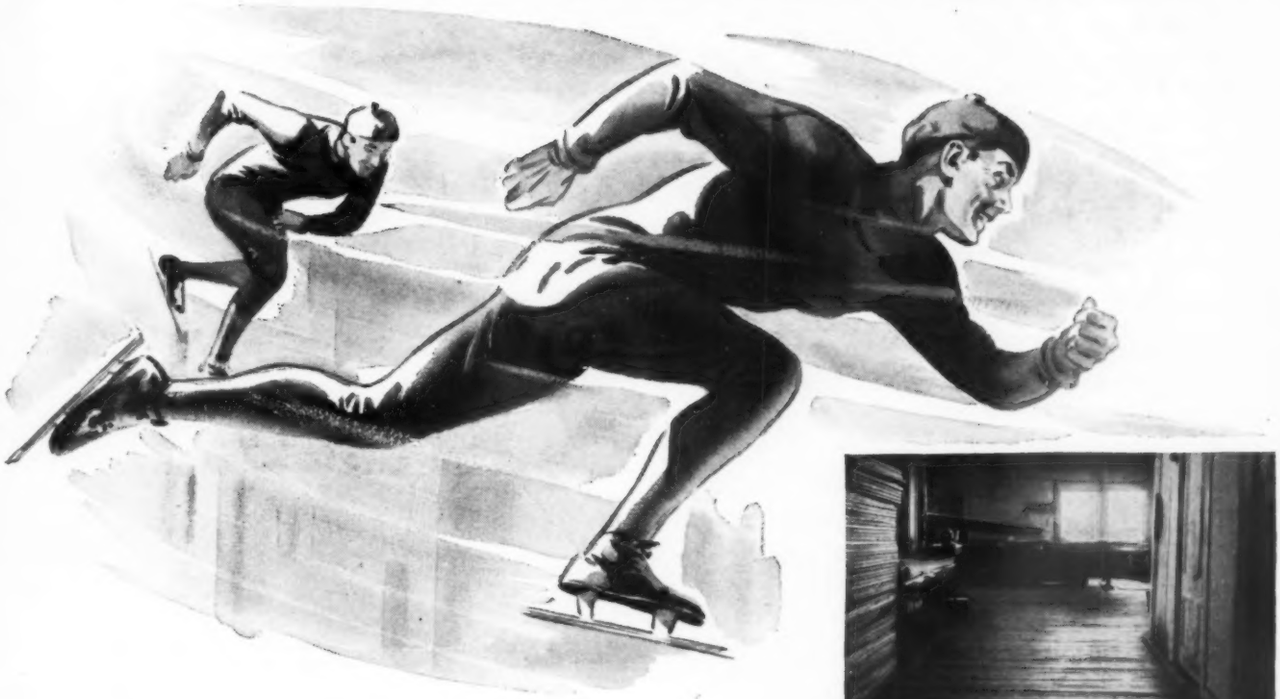
is completely self-contained and semi-portable for installation any place on the production line. Only a single- or three-phase electric line is needed. The all-metal type filters are easily removable for cleaning. Comes in different sizes and in varying heights. Wolverine Equipment Co., Cambridge, Mass.

Hole Cutter

Tools, called Clark 3 Blade Adjustable Hole Cutter, cut holes ¾ to 4½ inches in diameter. Available with Morse taper or straight shank, they can be used in portable electric or pneumatic drills, in drill presses, and in lathes. Manufacturer states that cutters will make clean holes in thin sheets or ¾-in. thick plates of metal, plastics, fiber, and pressboard. Can be used



SMOOTHNESS MAKES FOR SPEED



MIL-FLOR SPEEDS PRODUCTION . . . CUTS MAINTENANCE COSTS . . . REDUCES NOISE

WHEN you are studying how to speed production in your plant, consider the floors. Rough wood or concrete can slow down your trucks, wear down your workers, slow production in many ways.

Celotex Mil-Flor is a smooth, tough, resilient surfacing which can be laid in a hurry—by your own crew—over wood or concrete. It is non-slippery, wet or dry. It's resiliency lessens fatigue, smooths the way for factory traffic. And it deadens the rumble of truck wheels, reducing noise in space below.

Once installed, Celotex Mil-Flor means low maintenance cost, and it is available now. Write for complete information, and learn how Mil-Flor smoothness makes for speed!

This old, badly worn wood floor in a big eastern factory was a handicap to truck speed and foot traffic. The owners found an easy solution . . .

Celotex Mil-Flor covered the old boards with a smooth, tough surface, easy to stand on, easy to roll trucks on—quiet and durable!

CELOTEX
REG. U. S. PAT. OFF.

MIL-FLOR
TRADE MARK

A RESILIENT TOUGH FLOOR SURFACING

The word Celotex is a brand name identifying a group of products marketed by The Celotex Corporation.

THE CELOTEX CORPORATION • CHICAGO

FM&M 1-43

THE CELOTEX CORPORATION
Chicago, Illinois

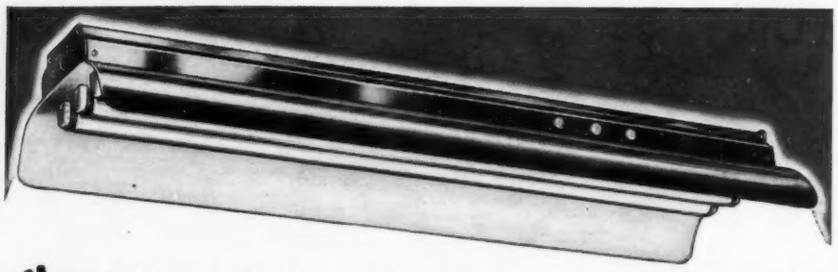
Please send complete information on Celotex Mil-Flor.

Name.....

Address.....

City.....

County..... *State*.....



"Skilled Lighting"

Gives the Answer!

Wheeler's new "War-Aid" RLM Fluorescent Fixtures retain top efficiency with Non-Metal Construction!

No longer is there any need to worry about continued supplies of high-economy, production-boosting fluorescent fixtures for war plants! Wheeler *Skilled Lighting* now includes new "War-Aid" Fluorescent Fixtures made with a minimum of hard-to-get sheet metal. What's more, all the lighting efficiency of previous models is retained!

New Non-Metallic Reflectors

Reflectors are made from a rugged, non-flammable, moisture-resistant non-metallic material. Reflecting surfaces of chip-proof, washable baked enamel have an enduring reflection factor of not less than 84% . . . provide minimum overall efficiency of 80% in 48" 2-lamp units, 73% in 3-lamp units and 73% in 60" 2-lamp units.

Wheeler "War-Aid" RLM Fluorescent Fixtures are available for Individual or Continuous Run installations.

Get Complete Data

Write for full details of Wheeler Non-Metallic Fluorescent Fixtures and complete catalog of Wheeler Incandescent Fixtures. **Wheeler Reflector Company, 275 Congress Street, Boston, Mass.** – New York – Cleveland. Representatives in principal cities.

Wheeler Non-Metallic Fluorescent Fixtures

- New Non-Metallic reflectors . . . sturdy, non-flammable, moisture-resistant.
- Chip-proof baked enamel finish . . . grey outside; permanent washable white reflecting surfaces.
- Provide full power-economy of fluorescent lamps, and undiminished overall lighting efficiency.
- Made for two or three 40-watt lamps, or two 100-watt lamps; in types for individual or continuous run installations.
- Reflector can be separated from wiring channel by loosening two thumb screws. Chain hangers prevent reflector body from dropping to floor. This feature permits quick and easy access to all operating equipment which is installed in wiring channel.
- No loose parts such as bolts, screws or nuts to handle.
- Fixtures can be mounted from chain, conduit, close to the ceiling, or can be provided with new "C" Clamp Slide Hanger.
- Design approved by Bureau of Standards. Performance guaranteed by RLM Standards Institute.

DISTRIBUTED EXCLUSIVELY THROUGH ELECTRICAL WHOLESALERS

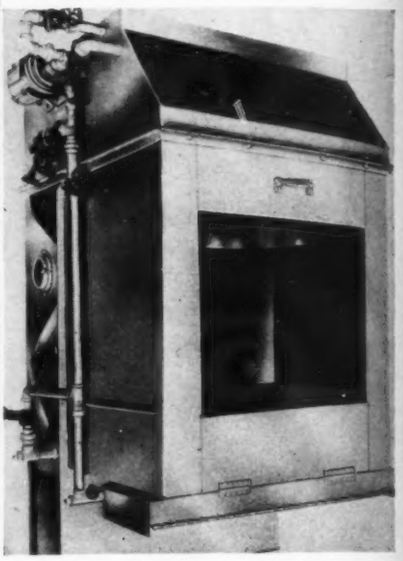
Wheeler REFLECTOR COMPANY

Lighting Equipment Specialists Since 1881

with pilot or lead drill. Tool bits are of high-speed steel and are replaceable. In six models with varying ranges. Robert H. Clark Co., 3424 Sunset Blvd., Los Angeles.

Paint Spray Booth

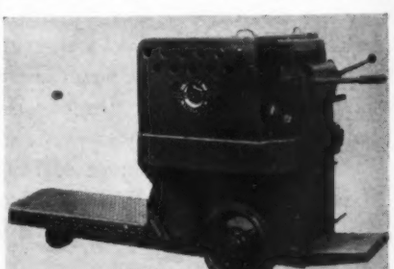
"Super-turbulent" water-washed walls is a feature of the Aqua-Restor paint spray booth. Spray nozzles are absent. Servicing is claimed to be negligible due to



elimination of moving parts. Used water may be drained directly or pumped for distant disposal. Equipped with turntable and fluorescent lighting and available in single or multiple units. Aqua-Restor Division, Mayer Manufacturing Corp., 45 Division Place, Brooklyn, N. Y.

Electric Truck

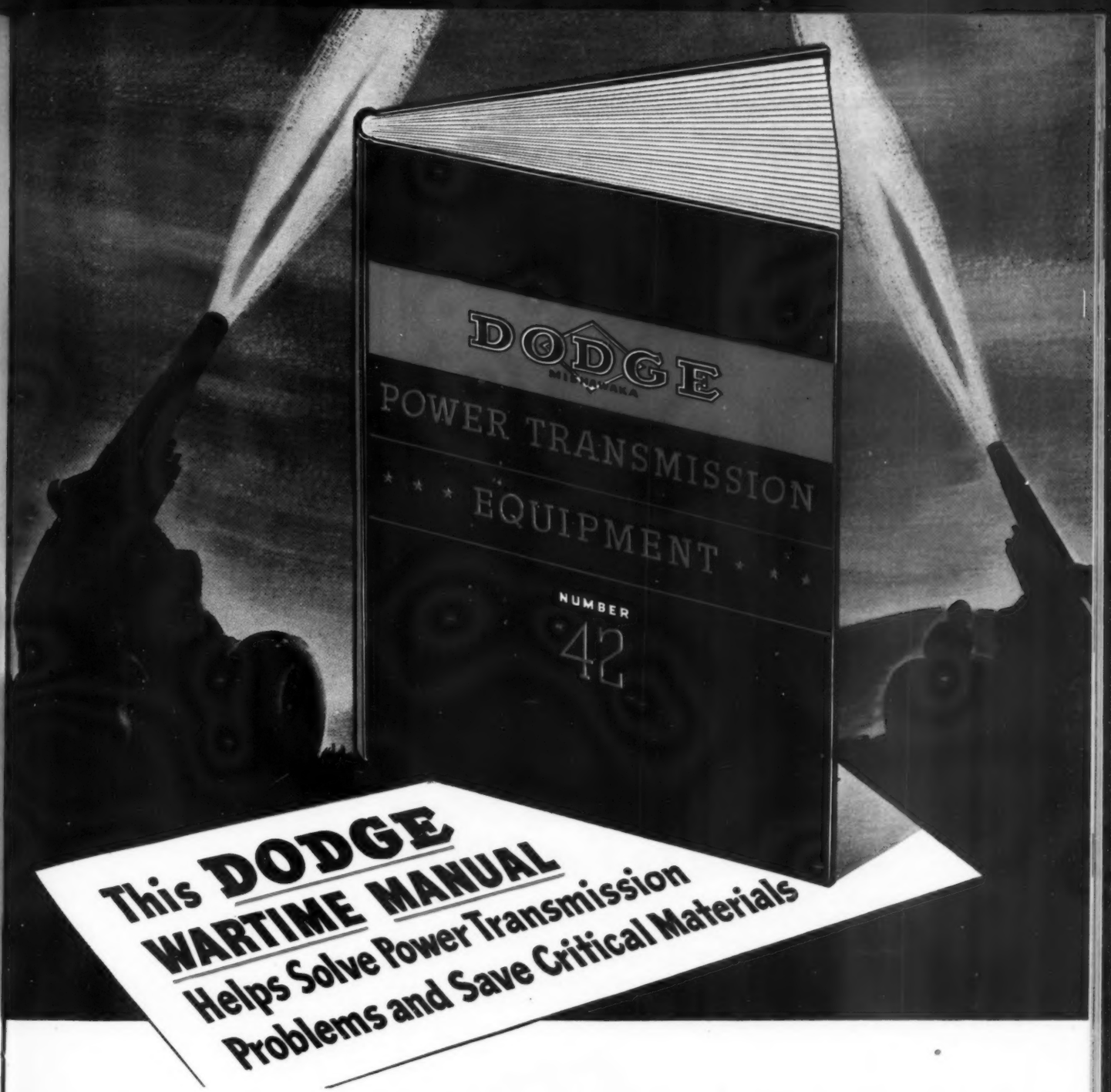
With the industrial electric lift truck, known as the Crescent Lo-Lif-Toer, the workman always rides. Pushing and pulling



are both eliminated. Truck handles loads up to 2,500 pounds, and is furnished complete with battery and charger. It will operate under 7-in. hand truck skids. Crescent Truck Co., Lebanon, Pa.

Rubber Lung

Devised for inexperienced hands to use on a victim suffering from suspended breathing due to shock, fumes and gases, drowning, etc., the Rubber Lung is strapped to the back or stomach. It adheres to the



This DODGE WARTIME MANUAL Helps Solve Power Transmission Problems and Save Critical Materials

THIS Dodge Wartime Manual of Mechanical Power Transmission has been compiled to assist in solving wartime power problems — to conserve power, increase production and save critical materials.

It is being released at a time when conservation of motors, power and critical materials is of vital importance. It is the "How Book" of the Dodge program aimed at helping industry to increase production — built around the fighting slogan — *"put all your power in the job."*

The new Dodge catalog offers alternate power transmission appliances that save critical metals — and help to throw more scrap into the fight. It presents power transmission equipment that steps up production — saves time —modernizes and increases productivity of present equipment — quickly — economically — effectively.

Between the covers of this new catalog, you will find "The Right Drive for Every Job" — Dodge D-V drives — bearings — pulleys — clutches and other power transmission appliances designed for use on individual, multi-motor and modern group drives.

Modern planned mechanical power transmission is a potent weapon ready *now* to wage war on power and material waste — to get more battle power out of horsepower.

Write today on your firm letterhead for the Dodge Wartime Manual of Mechanical Power Transmission.

DODGE MANUFACTURING CORPORATION
Mishawaka, Indiana, U. S. A.

THROW ALL YOUR SCRAP INTO THE FIGHT!

BUY U. S. WAR BONDS FOR VICTORY

DODGE
MISHAWAKA

THE RIGHT DRIVE FOR EVERY J

PUT ALL YOUR POWER IN THE JO

GREAT IDEA – THIS ROSS ROOF OVEN TO SAVE NEEDED FLOOR SPACE!
WORK IS CONVEYED UP TO THIS OVEN FROM SPRAY BOOTHS BELOW!
COULDN'T HAVE PUT THIS TYPE OVEN INSIDE THE PLANT

with floor space at a premium —additional baking ovens take to the *ROOF!*

Why give up valuable floor space to get that needed extra drying and baking capacity? Why not utilize your roof for an oven and release floor space for other equipment? A number of plants are now operating Ross Roof Ovens to real advantage.

•

Ask Ross engineers to determine if a roof oven can be installed to meet your building, product and processing requirements. They will gladly advise you without any obligation.

•

Write today for our Bulletin No. 130 that treats the entire subject of Industrial Ovens and shows various types of Ross Ovens—for floor and roof. An informative book—yours for the asking.

In plants where the installation of an oven might prove costly due to difficult floor layouts, Ross Roof Ovens can be more economical as well as extremely practical. With floor space at a premium they deserve careful consideration.

AIR FOR YOUR PROCESS
0° TO 1000°
ROSS INDUSTRIAL OVENS AND DRYERS

J. O. ROSS ENGINEERING CORPORATION

Main Office — 350 MADISON AVE., New York, N. Y.

201 North Wells St. CHICAGO, ILL.

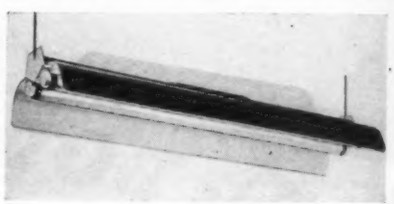
12253 Greeley Ave. DETROIT, MICH.

ROSS ENGINEERING OF CANADA, LIMITED, Dominion Square Building, Montreal

body through suction. Raising and lowering of the Lung handle at normal breathing rate is claimed to stimulate the action of the muscles to carry on the work of breathing. This natural breathing stimulus is claimed to be quick and effective even in unskilled hands and with no danger of injuring the patient. E. D. Bullard Co., 275 Eighth St., San Francisco.

Fluorescent Units

Fluorescent lighting units feature a non-metal reflector known as Lumenite. This material, it is claimed, is tough and strong, moisture- and high-heat resistant, non-corrosive, and non-scaling. Has high gloss



white enamel finish that gives good reflectance and lighting efficiency. Tulamp high power factor ballast is exposed through top of fixture and starter switches are mounted on top of unit. Model No. 2045 uses two 40-watt bulbs, Model No. 2046 two 100-watt bulbs. Mitchell Mfg. Co., 2525 Clybourn Ave., Chicago.

Conductive Flooring

Ready-mixed mastic flooring material, known as Condurock, is said to be a preventive of explosions due to static electricity. Material shows resistance as low as 700 ohms through a 5-lb. electrode with 5 square inches of contact area and floor not entirely free from dirt, it is claimed. Is spark proof and will carry heavy loads. The flooring has a dark red color, stands washings, and sets quickly. Can be used for table and work bench surfaces and for traffic areas. Rock-Tred Corp., Dept. F, 605 W. Washington St., Chicago.

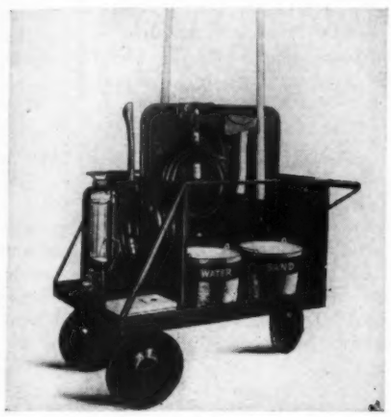
Skin Protection

"Fend" creams and lotions are stated to provide a protective barrier on the skin against many specific hazards in industry. The six types of Fend products, specially

prepared for varying kinds of industrial dermatitis, are the result of intensive research. Fend is to protect and act as an emolient to the skin. Mild soap and warm water removes the cream readily. Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pittsburgh.

Fire-Bomb Fighter

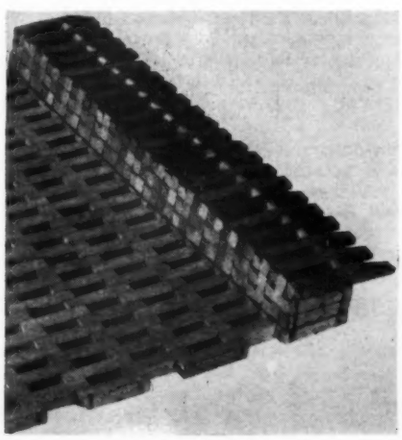
For "Johnny-on-the-spot" air raid protection, the Viking Fire-Bomb Fighter is a handily equipped 100-lb. truck. Its racks carry full equipment—buckets of sand and water, shovels, stirrup pumps, hose, axe, first aid kit, and other necessary air raid and firefighting equipment. Because it is easy to move from place to place, one



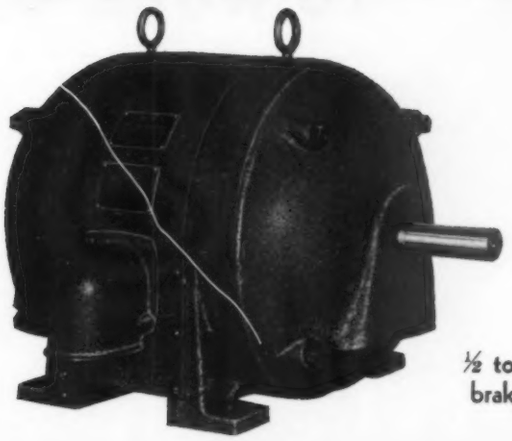
truck will serve 10,000 feet or more of floor space, saving duplication of equipment. The swivel back wheel allows for quick handling in small spaces. Comes in bright fire department red. Over-all specifications are 29x43x40 inches. Viking Air Conditioning Corp., 5600 Walworth Ave., Cleveland.

Flexible Wood Link Matting

Constructed of wood links, this matting is light in weight and can be rolled or folded up for easy handling and cleaning. Lying flat, it follows the contour of the floor and allows for good drainage. The ends are beveled to reduce the danger of tripping. Is usable in factories, on oily and greasy floors, and around machinery. In natural wood color, the mat is 1-inch



LIMA
ENGINEERED PERFORMANCE



½ to 75 hp brake test.

LIMA Electric Motors with oversize shafts and bearings are built to stand-the-gaff of twenty-four hour war production schedules.

Let us tell you how LIMA Electric Motors will maintain and increase your output. Write or wire us for address of Lima Engineering Service nearest you.

The LIMA Line Includes . . .

- Standard RS Drip-Proof Motors
- Standard L Open Motors
- Totally Enclosed Motors
- Explosion-Proof Motors
- Flanged Type Motors
- Gearhead Motors
- Special Types built to specifications
- Built-In Motors
- Lima Gearshift Drives
- Lima Magnetic Polishing Lathes
- Lima Electric Pedestal Grinders

★ Buy War Bonds for Quick Victory ★

Large enough to successfully serve you, yet small enough to give personal attention to your needs.

THE LIMA ELECTRIC MOTOR CO.
LIMA, O. OFFICES: NEW YORK · CHICAGO · DETROIT U. S. A.
LIMA ELECTRIC MOTORS · LIMA MAGNETIC POLISHING LATHES · LIMA GEARSHIFT DRIVES
LIMA PEDESTAL GRINDERS

GIVING 'EM *More* TO WORK WITH!

Awarded the Navy "E" for excellence in war production, P&H displays it also as a pledge of future effort.

CAPACITIES: 250, 500, 1,000 and 2,000 pounds

GETTING more "working tools" to battle-fronts — *faster* — that's the job for P&H Zip-Lifts in war plants today. These handy little electric hoists are speeding up materials handling along production lines — in store rooms — on loading platforms, etc. They're supplementing man-power and relieving worker fatigue so that both men and machines can produce more.

With bolt, hook, or trolley mounting — the P&H Zip-Lift is ready to go to work in a hurry, *anywhere*. Just hang it up and plug into any standard lighting circuit. Full magnetic push-button control makes it safer, easier to operate. It's the quality hoist in the low price field. Literature available on request.

General Offices: 4525 West National Avenue, Milwaukee, Wisconsin

HARNISCHFEGER CORPORATION

HOISTS • WELDING ELECTRODES • MOTORS P&H EXCAVATORS • ELECTRIC CRANES • ARC WELDERS

thick and comes in stock sizes of 18x32, 24x38, and 30x44 inches. Can be obtained in special sizes of any length up to 36 inches in width. American Mat Corp., 1745 Adams St., Toledo.

Carrier Frames

Carrier frames are rectangular containers without bottom, but with sidewalls formed into a channel shape to strengthen and hold wood inserts in position. Frames are fitted at each corner with steel lugs to permit several frames to be fastened or stacked together to form one rigid unit. Made in two sizes—30x20x5¾ inches and 30x30x3¾ inches. Three types of wood inserts may be used: Carriers with partitions, carriers with holes, and carriers with pegs. Carrier frames only are furnished. Inserts are made by the user to meet his own requirements. Lyon Metal Products, Inc., 3056 Clark St., Aurora, Ill.

Remote Control Wire Cutter

Known as the Longrange cutter, wire cutter handles energized or cold lines, and holds the wire until the cut is made. Jaw opening of 1½ inches takes heavy insulated wire, will cut up to 4/0 hard-drawn copper cable. Handle of two 4-ft.

wood sections is insulation tested for 75,000 volts per foot. Cutting action is controlled by rope. Manufacturer states that cutting blade can be replaced in 30 seconds. American - LaFrance - Foamite Corp., Elmira N. Y.

Air Transformer

On many automatic spray painting installations and in other operations where a large volume of regulated clean air is needed, an air transformer of greater capacity than the standard type is required. A heavy-duty air transformer is announced, the double-barreled Type HLC, with a capacity in excess of 100 c.f.m. The two pressure regulators, although functioning independently, are controlled

Pop aims to start the New Year right

BULLETINS
RESOLVED: THAT ANY GUY CAUGHT USING THE WRONG FILE FOR THE JOB GETS THREE SHAVES WITH A LATHE CUTTER.
THIS IS WAR!! MAKE EVERY FILE STROKE COUNT!
NO EXCUSE FOR FILE ABUSE... A FILE IN THE RACK IS WORTH TWO DOZEN ON THE SCRAP PILE!
1943
JANUARY
PEEK AT WHO'S LOOKIN' OVER POP'S SHOULDER AN' GUESS WHO'LL TAKE TH' LATHE-CUTTER CURE BEFORE TH' WEEK'S OUT...!
YOU COULDN'T MEAN FUMBLIN' OSWALD BY ANY CHANCE?!- NOT HIM!! WHY, POP WON'T NO MORE THAN BURN HIM TO TH' STAKE TH' NEXT FILE BULL HE MAKES..!
ALEXANDER

FREE REPRINTS of this and other recent "object-lesson" cartoons available for tool-crib and other shop bulletin boards. How many do you want?

Loyal American industry has but one aim—to produce to the utmost, that the war may be won as speedily as possible. Waste—in time, effort, tools and materials—must be reduced; short cuts devised; details simplified.

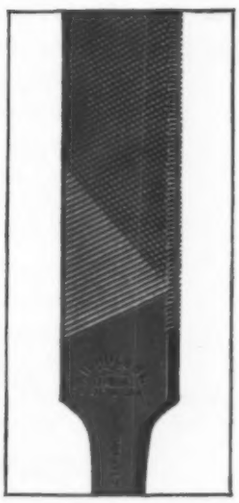
We're thinking specifically about filing. We know files. Been studying, designing and making them for 79 years. We've seen mass filing work on which there have been unbelievable savings in man-hours, materials and file expenditures through employee education in the elementary rules of proper *use* and *care* of files . . . and on the importance of selecting *The right file for the job.*

Besides making files capable of yielding the greatest possible number of efficient filing strokes, per file or per dollar, Nicholson has plenty of instructional literature to enable *bringing them out.*

To speed filing on specific metals or types of work, Nicholson or Black Diamond Special Purpose Files constitute a further important phase of the art of filing. There is an informative Nicholson Technical Bulletin, or capable engineering counsel, available on any special file or filing problem you may have. Ask your mill-supply house about further Nicholson filing-production helps. Or, write us direct.

FREE—*TECHNICAL BULLETINS*

on Nicholson or Black Diamond Special Purpose Files for Stainless Steel, Aluminum, Brass, Lead, Plastics, Die Castings, Foundry Castings, Die Making, Lathe Filing, Shear Tooth Filing *(smooth finishing on soft metals)*. Name ones wanted.



FOR STAINLESS STEEL *(at right)*—One of numerous Nicholson Special Purpose Files.

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Providence, R. I., U. S. A.
(Also Canadian Plant, Port Hope, Ont.)

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FOR EVERY PURPOSE

NICHOLSON U.S.A. MADE IN U. S. A.

SLY DUST CONTROL

GETS THE INVISIBLE DUST

★ Sly Dust Filter exhausting from metal working machinery—boring machines, drill presses, lathes, etc., in a large machine shop. The disposal of the dust is handled in the housing underneath the filter resulting in a trim, orderly appearance—just as efficient as it looks.

Often industrial dust is invisible—yet none the less damaging.

Due to the efficiency of their special cloth screens, Sly Dust Filters collect even their extremely fine dust.

Throughout the past period of over 40 years, we have demonstrated the value of thorough dust control in suppressing or collecting 111 kinds of dust in 57 industries.

Briefly, Sly Filters offer you:

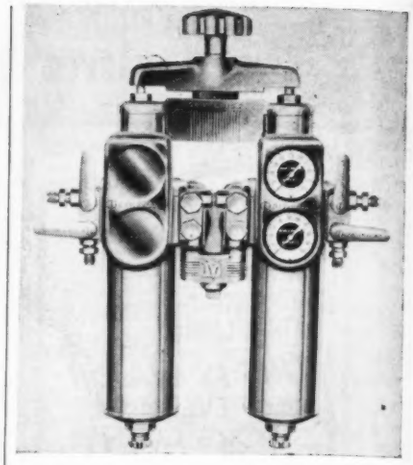
1. Greater filtering capacity because of more filtering cloth
2. Taut bags (patented) save power and improve dust removal
3. Bags more easily replaced
4. Automatic control (any degree) minimizes or entirely removes the human factor
5. Simpler shaker mechanism results in savings in maintenance and operation

Ask for Bulletin 98 and tell us about your dust problem so that we may write you fully.

THE W. W. SLY MFG., CO.

4755 Train Ave. Cleveland, Ohio

SLY
INDUSTRIAL DUST CONTROL



by a single knob for quick, easy adjustment. Filtering and condensing mechanisms are the permanent, all-metal type not requiring replacement of parts. The chatterproof diaphragms are of reinforced, oilproof synthetic rubber. Requires no more fittings or piping than single tube models. The DeVilbiss Company, Toledo, Ohio.

Mechanic's Protractor

A protractor, known as Wolfe Mechanic's protractor, is printed on phenol-resin laminated birch. Printed in red and lacquered, it is not affected by grease or

water, manufacturers claim. Gives readings for outside and inside angles and inches per foot against degrees. Lightweight and strength also are claimed. Interstate Sales Co., 1123 Broadway, New York.

Arc Welders

Simplicity of operation and portability are stressed in a.c. arc welder, Model 125. Furnished with vernier-type control panel, it has 16 welding heat stages, ranging from 10 to 125 amperes. Supplied for 110 or 220 volts. To do the bigger jobs, Model 360, has a range of 30 to 350 amperes. This model is mounted on casters for portability. Welders come fully equipped with necessary operating accessories. Trindl Products Ltd., CW2227 Calumet Ave., Chicago.

Protective Clothing

Ply Garb aprons and sleeves are made for both men and women workers who are exposed to water, acid, fire, alkalis, and

• • • SLOTTING ATTACHMENT BREAKS PRODUCTION BOTTLENECK!

Cutting square and rectangular holes in tool blocks and boring bars with existing equipment presented a real problem to a prominent machine tool manufacturer. The purchase and delivery of a vertical shaper for the purpose was "out," too, because of the time involved.

A request for assistance to the Emergency Production Service Department of Kearney & Trecker brought prompt action. Investigation showed that a Milwaukee Slotting Attachment applied to a Milwaukee 4K Plain Milling Machine, already available, handled all the operations involved with speed and precision. The production bottleneck was broken "pronto" — at a minimum of time and cost.

In the illustration above, the Attachment is being used in conjunction with a dividing head for milling splines on a gear. It can also be set in a vertical position for slotting dies, templets, or other operations.

Investigate the possibilities of Milwaukee Milling Attachments for increasing production.

Buy Victory with at least 10% in War Bonds!

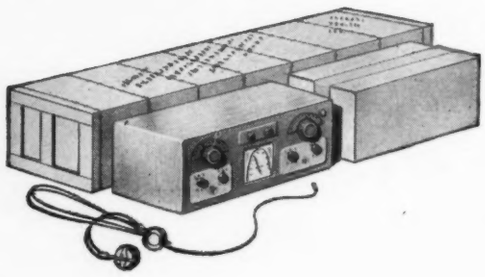
'43 FOR VICTORY

GET *ACTION* THIS WAY!

If you have a milling problem that needs immediate ACTION . . . wire the details to our Emergency Production Service Department. We'll have a Sales-Serviceman contact you or send full information quickly.

KEARNEY & TRECKER CORPORATION
MILWAUKEE, WISCONSIN

Milwaukee MACHINE TOOLS



Cannoneers have "extra" ears

AS IMPORTANT as their manufacture, is the arrival *in good condition* of replacement and repair parts. Whether such material goes into storage or travels thousands of miles over land and sea, it must be packed in containers which meet Uncle Sam's specifications.

Co-operating with scores of manufacturers of war products, General Box engineers have obtained wide experience and a thorough knowledge of the requirements for war products containers.

If you have a shipping container problem, General Box may be able to solve it quickly, may be able to help you determine which of the allowable alternates is most practical for your product. Write us.

For manufacturers of war products: General Heavy Duty Wire-Bound and Nailed Wooden BOXES and CRATES
For Domestic Service: Corrugated BOXES and Wood Cleated Fibreboard CRATES
Discontinued for the Duration: Generalite and Nailed Strapped BEVERAGE CASES

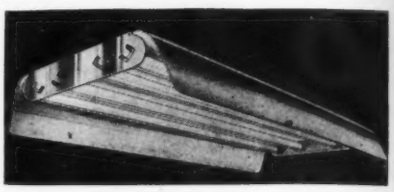
GENERAL BOX COMPANY

GENERAL OFFICES: 504 North Dearborn Street, Chicago, Illinois
DISTRICT OFFICES AND PLANTS: Brooklyn, Cincinnati, Detroit, East St. Louis, Kansas City, Louisville, Milwaukee, New Orleans, Sheboygan, Winchendon; Continental Box Company, Inc.: Houston, Dallas.

all kinds of chemicals. Designed of a featherweight but durable plastic laminated cotton cloth, Ply Garb is flameproof and supposedly tear resistant. Available in both full-front and split-front models, adjustable shoulder straps allow for fit of the individual. Sleeves feature special air vents to guard against excessive perspiration. Milburn Co., Detroit.

Wood-Reflector Fixture

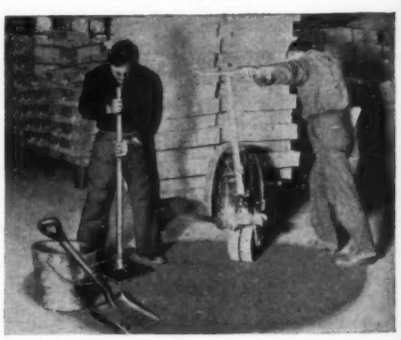
Lighting unit, called Super-Maze-Lite, designed to furnish high-intensity lighting for industrial inspection areas, uses a nonmetallic reflector. Bump-proof ends protect lampholders against abuse and insure



correct distance between lamps. Reflector, which has deep light cutoff, is formed of wood composition. Available with Forlamp ballast for 265 volts; also available for 110-125 and 220-250 volt circuits; in two sizes, either for four 40-watt or four 100-watt fluoresent lamps. Edwin F. Guth Co., 2603 Washington Ave., St. Louis.

Floor Patch

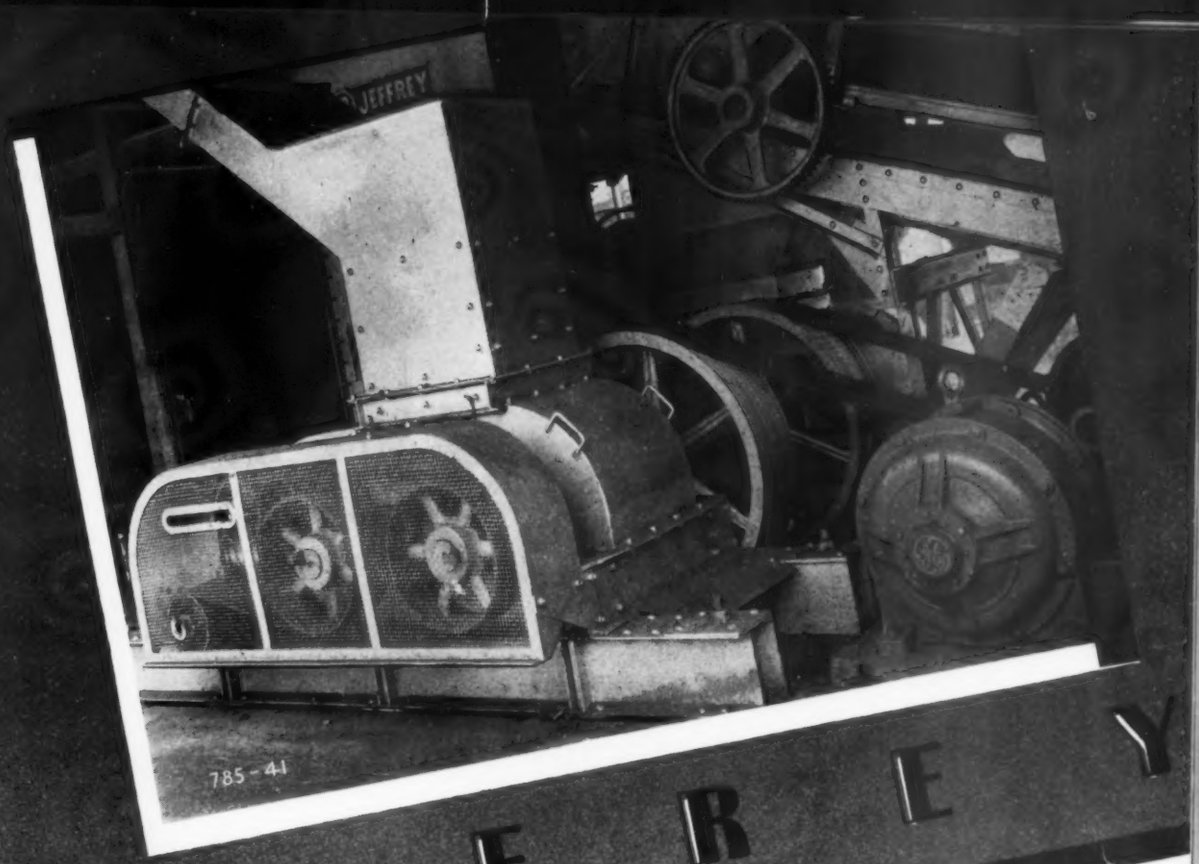
Ready-mixed floor patch, called Instantuse, repairs ruts and holes in industrial floors. According to the manufacturers, this patching material is placed in a swept and



primed hole and tamped, and the patched place can be used immediately. Holds in concrete without chipping or breaking up of old surfaces. Compacts under traffic. Requires no mixing and no skill to apply. Flexrock Co., 23rd & Manning Sts., Philadelphia.

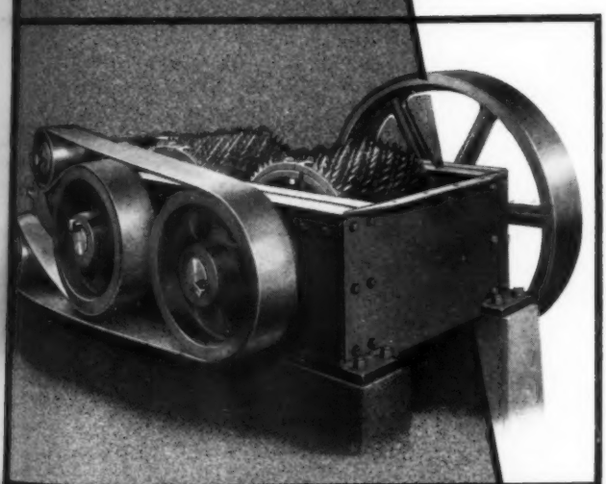
Pneumatic Drill

Lightweight pneumatic drill, identified as Size 00A drill, weighs less than 2 pounds. Powered by a multi-vane air motor, it contains a built-in speed regulator and split-second throttle action. Lubrication is provided by a built-in automatic oiler. Fit-the-hand pistol grip reduces



J E F F R E Y

THE NATURAL CHOICE



Jeffrey crushing and pulverizing equipment . . . the preference of shrewd management for all kinds of special reduction operations on critical materials. The double roll crushers shown above are reducing coke to uniform size for use in the production of carbide, another example of our ability to serve the entire chemical industry. An opened-up view of the Jeffrey double roll crusher is shown at the left.

We can help you meet each new demand for a sized product . . . help you meet certain specifications exactly. Single, double roll and "Flextooth" crushers; rigid and swing hammer pulverizers and shredders; hammermills and grinders . . . designed by experienced reduction engineers to do the job right.

THE JEFFREY MANUFACTURING CO

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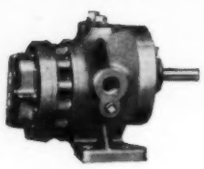
Buffalo	Cincinnati	Houston	Philadelphia	St. Louis
	Detroit	Huntington	Pittsburgh	

FROM RAW MATERIAL . . . TO VICTORY

Roper Hydraulically Balanced Pumps Save TIME, SPACE and POWER

50% Saved

One customer writes: "So far the new Roper has proved the easiest of all to install. In fact, the last 6 Ropers installed saved 18 hours labor... about 3 hours on each." Other Roper users report savings of installation time up to 50%.



52% Saved

Roper *direct-drive* Pumps require only 48% as much floor space as other models . . . and in the many plants that are loaded to the guards with war production, space is priceless.

20% Saved

Roper *hydraulically balanced* Pumps reduce power consumption as much as 20% . . . a saving important to the Victory program as it releases the unneeded power for other vital operations.

3 Series Of Pumps

Capacities from one to 1000 gallons per minute . . . pressures up to 1000 lbs. per square inch . . . speeds up to 1800 r.p.m. . . . 21 drives and mountings . . . 8 piping arrangements.

Handle Any Liquid

Any liquid free from abrasives can be pumped by a Roper. It makes no difference how thick or how thin the liquid is, a Roper will handle it economically and efficiently.

ROPER

Rotary Pumps

Write for Catalog 938. It contains a summary and a digest of valuable information on pumps and pumping problems.

GEO. D. ROPER CORP., ROCKFORD, ILL.

fatigue, it is claimed. Chuck shield offers protection and enables the operator to guide the drill by grasping the shield with the fingers of his free hand. Ingersoll-Rand Co., 11 Broadway, New York.

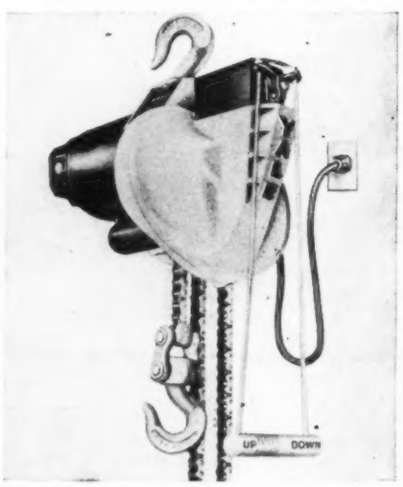
Woman's Safety Shoe

Wood sole safety shoe especially designed for women. Patterned after the wooden clog popular with high school and college girls, this toughwearing blucher type oxford features a well-covered instep for

safety and a combination last for better fit. The 2-in. heel is covered with a composition lift to eliminate noise. All seams are claimed to be watertight. Comes in full-grain army tan leather, sizes 5 to 10. F. J. Stahmer Shoe Company, Davenport, Iowa.

Electric Hoist

Electric hoist, known as the Midget King, is small and portable. Made in both a.c. and d.c. models, it requires only a place



to hang from and an outlet to plug into. Hoists made in $\frac{1}{8}$-, $\frac{1}{4}$-, $\frac{1}{2}$-, and 1-ton capacity. Tested, according to manufacturers, to 50 percent overload. The Yale & Towne Mfg. Co., Philadelphia.

Snap-on Tools

HELP SPEED DISASTER TO THE AXIS!

VICTORIOUS POWER for America's Flying Fortresses...and for many another potent warplane . . . down the long assembly lines at Wright Aeronautical Corporation roll the mighty Cyclone "9s"! Here's bad news in big volume for the Axis everywhere!

On Wright's powered assembly lines high production is accompanied by *high precision* . . . and swift, efficient Snap-on Wrenches play an important part. Many of these Snap-on Tools are specially made or adapted for operations on the line.

The accuracy, flexibility and solid power of Snap-on Wrenches lend extra speed and precision to difficult jobs. From production and assembly line to maintenance shop and far-flung bomber base . . . wherever ships are built and flown and serviced . . . Snap-on Wrenches and Hand Tools have demonstrated their exceptional fitness for aviation's needs. Snap-on's 3,000 tools and direct-to-you service are conveniently near you through 35 factory branches at key aviation centers throughout the United States and Canada. For catalog, write —

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THE CHOICE OF BETTER MECHANICS

SNAP-ON TOOLS CORPORATION
8044-A 28th Avenue Kenosha, Wis.

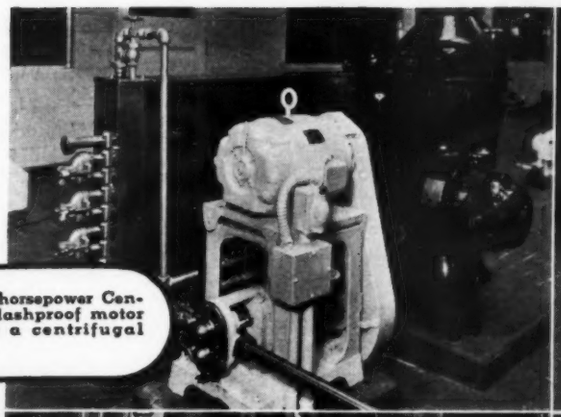
No Time For "Flinching"

The sharpshooter on the fighting line squeezes shot after shot at the enemy target—no hesitation, no lost motion, no flinching. Today the operator on the production line must perform his job with equal efficiency, *without hesitation*, *lost motion* or *flinching*. Bausch & Lomb Safety Goggles can help him to do it!

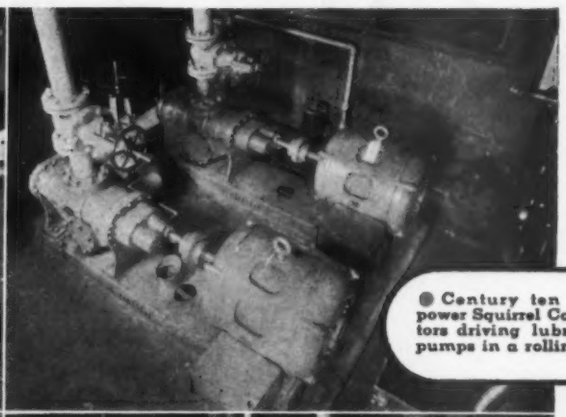
Fear of eye injury, conscious or subconscious, can cause machine operators to flinch. As a result, they lose valuable production time and make costly errors. Workers wearing Bausch & Lomb Safety Goggles have complete confidence in the ability of these goggles to protect their eyes from injury. They are working with the efficiency and accuracy which only protected eyesight can assure. For employees with defective eyesight, prescription ground, impact resistant lenses provide visual correction *plus* protection.

Remind your employees of the importance of eyesight protection to the war effort. Copies of the Bausch & Lomb poster shown above are available upon request. Bausch & Lomb Optical Company, 650 St. Paul Street, Rochester, N. Y.

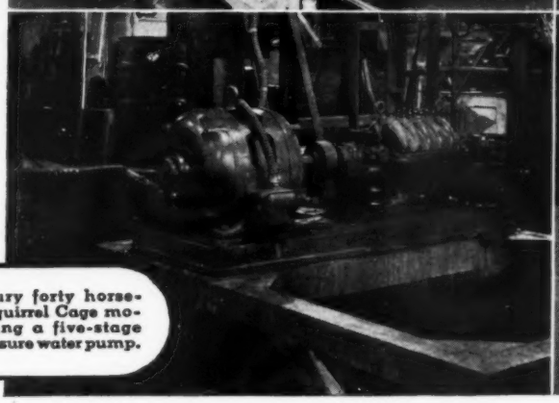
BAUSCH & LOMB
Safety Goggles



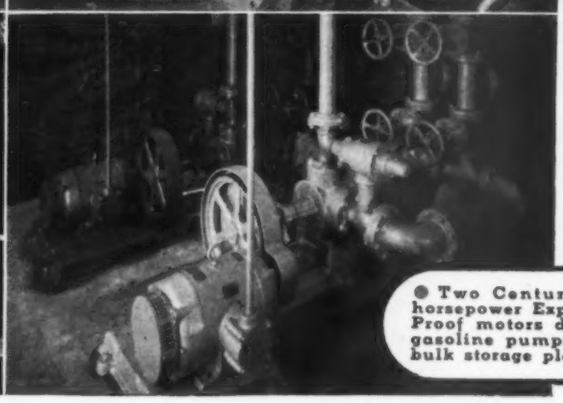
● Two horsepower Century Splashproof motor driving a centrifugal pump.



● Century ten horsepower Squirrel Cage motors driving lubricating pumps in a rolling mill.



● Century forty horsepower Squirrel Cage motor driving a five-stage high pressure water pump.



● Two Century five horsepower Explosion Proof motors driving gasoline pumps in a bulk storage plant.

CENTURY MOTORS Meet Your Centrifugal or Reciprocating Pumping Application Requirements In All Types of Atmospheres—on Land or Sea

There's the *right* Century Motor for these and many other pumping requirements:

Water	Gasoline
Oil	Beverages
Brine	Chemicals
Paint	Liquid Drugs

Lubricating Oils and Coolants
Liquid Foods
Hydraulic Machinery
Condensates

—properly protected against these surrounding conditions:

Salt Air
Acid and Alkali Fumes
Dusts
Coolant Spray
Heat and Cold
Moisture
Explosive Grain Dusts (Class II, Group G)
Explosive Gases (Class I, Group D)

304

Century Motors are built to meet practically every type of pumping application efficiently and effectively — on land or sea.

Depending upon the surrounding operating conditions, pump installations may require *Century Open, Drip Proof, Splash Proof, Totally Enclosed Fan Cooled, or Explosion Proof Motors.*

To assure peak performance, it's important to select the Century Motor with the proper electrical characteristics. These may vary from low starting torque—low starting current for centrifugal pumps, to high starting torque — normal starting current for reciprocating or gear pumps and for starting other dead load applications.

Century MOTORS

Help You Beat the Production Promise

As in other fields, Century's wide range of motor types and sizes makes it an easy matter to apply the correct motor to pumping uses—motors which match the type of liquid pumped, the pressures desired, and the surrounding working conditions. Your nearest Century Application Engineer and Service Organization will gladly help you with any pumping problem. Call him in today.

CENTURY ELECTRIC CO. • 1806 Pine St., St. Louis, Mo.
Offices and Stock Points in Principal Cities

ONE OF THE LARGEST EXCLUSIVE MOTOR AND GENERATOR MANUFACTURERS IN THE WORLD

Buell Dust Recovery Systems help put it there

HIGH EXPLOSIVES are "booming" these days. America's arsenals are turning out astronomical quantities of bombs, shells and torpedoes...every one with a deadlier-than-ever "boom" for our enemies.

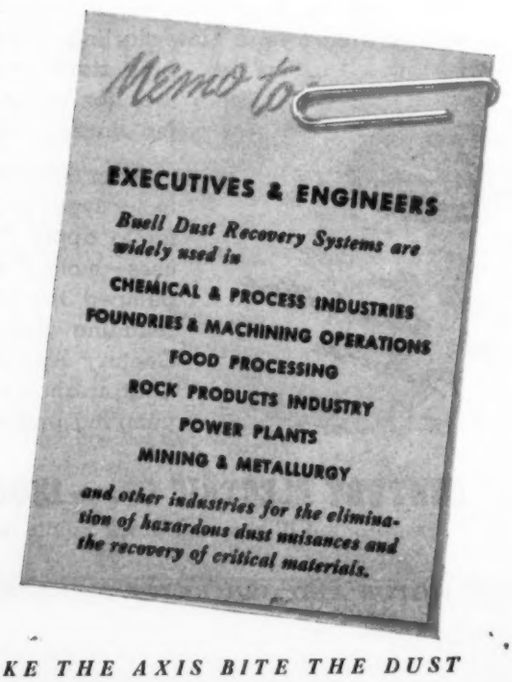
Sulphuric acid is important in the manufacture of explosives, but absolute purity of the acid is essential. Buell Dust Recovery Systems are used in conjunction with the contact method of making sulphuric acid because their high efficiency in removing contaminating flue dust from the sulphur dioxide gas assures purity in the finished product.

This is just one of many ways in which versatile Buell Dust Recovery Systems are helping industry achieve its war production goals by preventing contamination and salvaging critical materials for re-use. The van Tongeren "shave-off"—an ingenious design feature found only in Buell cyclones—insures exceptionally high collection efficiency, low operating cost and long life. Buell cyclones have no moving parts and require little or no maintenance or attention.

Buell Dust Recovery Systems easily handle high temperature gases, and can be installed for any desired capacity from 300 c.f.m. up.

BUELL ENGINEERING COMPANY, INC.
12 Cedar Street, New York
Sales Representatives in Principal Cities

Factual 28 pg. book. Write for Bulletin FO-1.


Memo to
EXECUTIVES & ENGINEERS
Buell Dust Recovery Systems are widely used in
CHEMICAL & PROCESS INDUSTRIES
FOUNDRIES & MACHINING OPERATIONS
FOOD PROCESSING
ROCK PRODUCTS INDUSTRY
POWER PLANTS
MINING & METALLURGY
and other industries for the elimination of hazardous dust nuisances and the recovery of critical materials.

BUY WAR BONDS AND MAKE THE AXIS BITE THE DUST

How Group Bonus Works

(*Continued from page 81*)

Rip to Width. When boards are edged only, because the finished width is less than 3 inches, this operation follows the edging, and the times are identical with those in Table 2.

Fitting. This operation is performed on a percentage of the boards between 6 and 9 inches in width and on all boards over 9 inches. This gets necessary width out of two or more boards instead of one. Times for fitting various widths are given in Table 3.

TABLE 3

Width in Inches	*Time per Linear Inch*	*Width in Inches*	*Time per Linear Inch*
6½	.0082	16½	.0117
7	.0083	17	.0118
7½	.0087	17½	.0119
8	.0088	18	.012
8½	.0092	18½	.0121
9	.00945	19	.01225
9½	.0097	19½	.0124
10	.0099	20	.0125
10½	.01	20½	.0126
11	.01015	21	.0127
11½	.01025	21½	.0128
12	.01045	22	.0129
12½	.0107	22½	.01295
13	.0108	23	.013
13½	.0109	23½	.0131
14	.011	24	.0132
14½	.0112	24½	.01325
15	.0113	25	.0133
15½	.0114	25½	.01345
16	.0116	26	.0136

Note—This is a one-man job.

Matching. After the boards have been fitted to width they must be grooved, tongued, and glued, or simply matched. Table 4 gives the time for matching. This is a three-man job.

Rip to Finish Width. After matching the next operation is to rip the matched boards to finished width. The times are the same as for the edging and ripping as given in Table 2. This is a two-man job—one feeding and one putting away.

Finish Resaw. When boards are planed to double thickness, they are then resawed to finish thickness, with times given in Table 5. Two men—one feeding and the other putting away.

Saw to Finish Length. This operation by one man on a gangsaw if wide, and on a swingsaw if under 6 inches. The time for the gangsaw is 0.09 min-

Latest aircraft bottleneck: Plumbing.

One company has told Washington it can't meet production schedules unless equipment for women's rest rooms is made available. Without it company can't hire necessary women workers.

• • •

TAKE CARE OF NEW EMPLOYEES

Providing washing facilities for women workers can be easily accomplished with Bradley Washfountains. These group fixtures widely used by all industry, serve clean running water to 8 to 10 persons simultaneously. Physicians say that adequate *sanitary* washing is a well recognized preventive for skin affections and thereby saves lost hours and days of production.

BRADLEY GROUP WASH FIXTURES REDUCE DERMATITIS AND ABSENTEEISM

Extra employees require added washing facilities so that the benefit of their labor can be used to the maximum,—with less time wasted in the washroom, and less absenteeism. Installation of Bradley Washfountains is simple and quick,—critical metals are saved,—janitor and maintenance work practically eliminated.

Bradleys serve greater numbers in less space and encourage regular and proper washing. An ounce of prevention is worth a pound of cure . . . Is your plant adequately equipped with sanitary washing facilities? Do you require additional washrooms for women employees? Then write for Catalog 4010 . . . BRADLEY WASH-

Each Bradley takes the place of 8 to 10 "single-person" w basins. Bradleys thus reduce piping connections by 80% piping connections replace 24 to 30). Installation time is drastically. The number of women employees taking t places in our essential war production plants require imm ate washing facilities of this accepted sanitary type.

BRADLEY *washfountain*

A CHECK-LIST of LIQUIDS

that are being handled More Efficiently and at Less Cost by

BLACKMER · ROTARY · PUMPS

Acids	Glucose	Printing ink
Acetates	Glue	Rubber cement
Alcohols	Glycerine	Salad dressing
Ammonia	Grape juice	Shellac
Beer	Kerosene	Silicate of soda
Bilge water	Lacquers	Sizings
Bleaches	Lard (hot)	Soaps
Brines	Mayonnaise	Solvents
Catsup	Mineral oil	Soups
Caustics	Molasses	Starches
Cream corn	Oils—	Syrups
Creosote	Cooking	Tan Liquor
Dog food	Crude	Tar
Dyes	Lube	Tomatoes
Enamels	Vegetable	Turpentine
Fish oils	Naphtha	Varnishes
Fuel oils	Paints	Vinegar
Gasoline	Paraffine	Yeast

Check your requirements on this list and mail it to us NOW. We will show you how and why Blackmer Pumps can cut costs in your plant.

POWER PUMPS: 5 to 700 GPM, up to 300 psi.
HAND PUMPS: 7 to 25 GPM. 54 models.

PROMPT DELIVERY TO WAR PRODUCTION PLANTS

Bulletins FREE to Pump Users

No. 301: Facts about Rotary Pumps
No. 302: Pump Engineering Data
No. SER-1: How to Make Pumps Last Longer

Write Blackmer Pump Company, 2101 Century Avenue, Grand Rapids, Michigan

BLACKMER Rotary PUMPS
"BUCKET DESIGN"—SELF-ADJUSTING FOR WEAR

ute for one length and 0.12 for a double length. The number of boards sawed at one time is 2½ inches divided by the thickness of one board. The time on the swing is 0.20 minute for one length and 0.10 additional for each extra length. The number of boards sawed at one time is 3¼ inches divided by the board thickness.

TABLE 4

Width in Inches	Time in Min.	Width in Inches	Time in Min.
6½	.12	16½	.255
7	.125	17	.265
7½	.13	17½	.27
8	.135	18	.2775
8½	.1405	18½	.286
9	.1445	19	.2945
9½	.147	19½	.307
10	.1505	20	.32
10½	.165	20½	.325
11	.17	21	.33
11½	.17	21½	.34
12	.1825	22	.35
12½	.185	22½	.36
13	.195	23	.37
13½	.205	23½	.38
14	.215	24	.39
14½	.22	24½	.402
15	.2275	25	.415
15½	.23	25½	.425
16	.245	26	.43

TABLE 5

Width in Inches	Time per Linear Inch	Width in Inches	Time per Linear Inch
up to 8"	.002	17½	.0036
8½	.00212	18	.00365
9	.0022	18½	.00375
9½	.00225	19	.00385
10	.0023	19½	.00392
10½	.00235	20	.004
11	.0025	20½	.0041
11½	.00255	21	.0042
12	.0026	21½	.0043
12½	.0027	22	.0044
13	.0028	22½	.0045
13½	.00288	23	.0046
14	.00295	23½	.0047
14½	.003	24	.0048
15	.00325	24½	.0049
15½	.0033	25	.00505
16	.00355	25½	.0054
16½	.0034	26	.00575
17	.00345		

Printing. Printing in one or two colors is done by two men, one feeding and the other putting away. Times are given in Table 6.

Splicing. Boards that are matched are often spliced when the case ends are not reinforced by cleats. The time for splicing is 0.06 minute and is a one-man job.

(*Continued on page 194*)

. . . without cutting power

Moving machinery—changing shop set-ups —is an everyday job in modern war plants. But it's a quick and easy job in plants equipped with sectionalized, prefabricated "plug-in" Bus Duct.

No cutting, taping or other fabrication is necessary in making the original installation — or in changing the location of a machine or a whole production battery.

Just move the circuit protective "plug" right with the machine, mount it on the Bus Duct at the "plug-in" opening nearest the new location — and the job is done without cutting power, interrupting production, or taking the dangerous alternative of tapping in "hot."

All through America's non-stop production drive Bus Duct is saving countless man-hours, multiplying efficiency, protecting against fire and sabotage, safeguarding human life . . . and all this with a minimum use of critical materials.

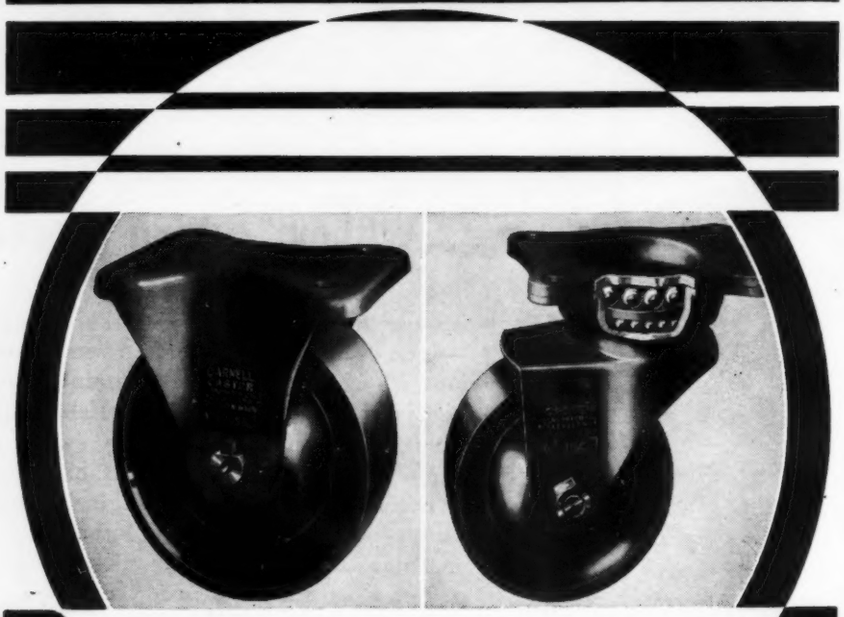
Modern Bus Duct is an integral part of the machine tools it serves. Small wonder that it has become a *necessity* in present-day mass production.

BUY MORE WAR BONDS—SALVAGE ALL SCRAP METAL

BULLDOG
ELECTRIC PRODUCTS CO.
Detroit, Michigan
BullDog Electric Products of Canada, Ltd., Toronto, Ontario
Field Engineering Offices in All Principal Cities

BULLDOG "PLUG-IN" SYSTEMS—THE ARTERIES THAT SUPPLY POWER AND LIGHT FOR WAR PRODUCTION

DARNELL
CASTERS & WHEELS



SPEED WAR PRODUCTION

★★★★★★★

Darnell Double Ball-Bearing Casters and E-Z-Roll wheels reduce floor wear to a minimum, lengthen the life of equipment and increase the efficiency of employees—Write for 192 page Darnell Caster and Wheel Manual.

DARNELL CORP. LTD., 60 WALKER ST., NEW YORK, N.Y.
LONG BEACH, CALIFORNIA, 36 N. CLINTON, CHICAGO, ILL.

★★★★★★★

(*Continued from page 192*)

Handholing. When cases are not cleated for handling, a handhole is cut in each end for a grip by which to lift the case. When the quantity ordered is very large, the printing machine can be set up to cut this hand grip. Otherwise it is done on a hand cutter, and the time allowed is 0.0425 minute. It is a one-man job.

TABLE 6

Length of Board in Inches	*Time in Min.*	*Length of Board in Inches*	*Time in Min.*
Up to 10"	.014	33	.03
11	.015	34	.0315
12	.0155	35	.032
13	.0165	36	.032
14	.0175	37	.0325
15	.0180	38	.033
16	.019	39	.0335
17	.02	40	.034
18	.021	41	.0345
19	.0215	42	.035
20	.022	43	.0355
21	.0225	44	.036
22	.023	45	.0365
23	.024	46	.037
24	.0245	47	.0375
25	.0255	48	.038
26	.026	49	.0385
27	.027	50	.039
28	.028	51	.0395
29	.0285	52	.04
30	.029	53	.04
31	.03	54	.0405
32	.03	55	.041

Assembling. Assembling is done by nailing machines. Cleats are nailed two to each end in 0.233 minute. The sides are nailed to the ends on one machine and the bottom to the frame on another. Times are given in Table 7.

TABLE 7

Length of Case in Inches	*Time in Min.*	*Length of Case in Inches*	*Time in Min.*
10	.35	34	.57
12	.36	36	.59
14	.385	38	.62
16	.40	40	.64
18	.415	42	.67
20	.42	44	.70
22	.43	46	.73
24	.45	48	.77
26	.475	50	.80
28	.50	52	.83
30	.52	54	.85
32	.545	56	.87

Note: For nailing bottom, use 50 percent of times in Table 7.

Time for moving work and setting

PRODUCTION up 36%!

Manufacturers of 20 mm. shells report increased machine output with

EN-AR-CO PROMAX CUTTING OILS

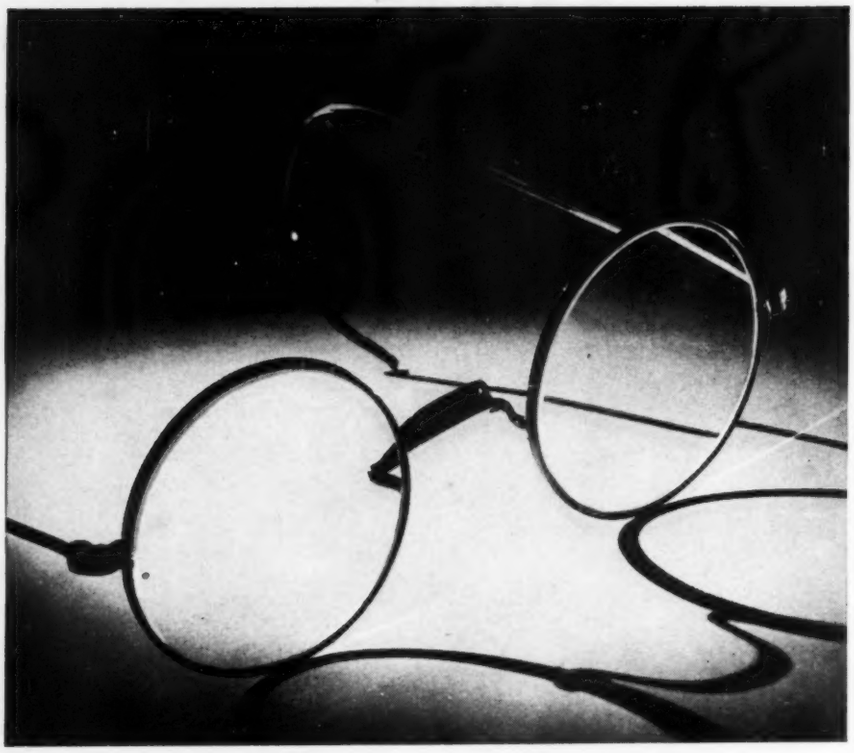
• For over 60 years The National Refining Company has pioneered in the development of Industrial Lubricants. Our engineers will cooperate with you in maintaining your plant and equipment at its wartime best.

• *Here's why*—PROMAX provides improved lubrication between chip and tool, plus a more effective cooling action, permitting higher machining speeds, better finish and longer tool life. • Whatever *your* cutting oil requirements may be—whether you are machining copper, brass, high carbon or alloy steels—there is a PROMAX Cutting Oil, *performance-tested*, to help you meet today's increased production schedules. • *Write today for information on the PROMAX Cutting Oil best adapted to your individual production needs.*

EN-AR-CO INDUSTRIAL LUBRICANTS

THE NATIONAL REFINING COMPANY

Cleveland • Indianapolis • Chicago • Peoria • Omaha • Kansas City • Memphis



There will be FEWER OF THESE

Eyeglasses symbolize eyestrain. By reducing eyestrain through proper lighting, your war production can be increased both in quantity and quality. Fewer man-hours will be lost, fewer rejects will come off your production lines.

Silv-A-King offers a complete lighting service—fine equipment (either fluorescent or incandescent) plus skillful engineering to lay out your lighting installation for maximum effectiveness. Our ability to serve you well in lighting comes from 21 years of experience as industrial lighting specialists. A Silv-A-King lighting engineer is at your call wherever you are located.

Bright Light Reflector Company, Inc.,
1027 Metropolitan Avenue, Brooklyn, N. Y.

Write for new, 16-page Silv-A-King book:
"Light Is An Essential Production Tool"

A Few Typical Silv-A-King Users:
AC SPARK PLUG
GENERAL MOTORS
FISHER BODY
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JONES & LAUGHLIN STEEL
PITTSBURGH PLATE GLASS
and many others

FLUORESCENT · INCANDESCENT
SILV-A-KING
EQUIPMENT

SILV-A-KING MAKES *Light* WORK FOR YOU

up machines must also be allowed as in Table 8.

TABLE 8

Operation	*Set Up in Min.*
Resaw	4.0
Plane	2.0
Rip	1.0
Fit	1.0
Match	2.0
2nd Resaw	1.0
Gangsaw	1.5
Swingsaw	1.5
Print	7.5 (one color)
Print	10.0 (two colors)
Nail	5.0

Allowance for Indirect. To allow for the indirect and non-productive hours, Table 10 shows the base rates and classification.

TABLE 10

Classification	*Base Rate*	*Production Hours*	*Man-Hours*
Resaw	.63	7.5	8
Resaw helper	.60	7.5	8
Planer	.60	7.5	8
Planer	.60	7.5	8
Sawyer	.60	7.5	8
Sawyer	.60	7.5	8
Sawyer	.60	7.5	8
Sawyer	.60	7.5	8
Gang boss	.72	0	8
Matcher	.66	7.5	8
Matcher Helper	.60	7.5	8
Matcher Helper	.60	7.5	8
Fitter	.63	7.5	8
Resaw	.63	7.5	8
Resaw Helper	.60	7.5	8
Printer	.66	7.5	8
Helper	.45	7.5	8
Nailer	.63	7.5	8
Nailer	.63	7.5	8
Total		135.0	152

Ratio of man-hours to productive hours is 1.13. Therefore 1 minute is equivalent to 1.13 points.

Actual Case. Suppose it is wanted to figure the point value for a case with the following dimensions. (One-hundred cases are in the order.)

Ends—$13\frac{1}{2} \times 5\frac{1}{2} \times \frac{13}{16}$
Sides—$22 \times 5\frac{7}{16} \times 1\frac{1}{8}$
Top and bottom—$22 \times 13\frac{1}{2} \times \frac{1}{2}$

Ends	*Minutes*
1. Set up resaw—4.0×2	
2. Resaw $2\frac{1}{8}$ plank—0.268×2×(1÷9)×0.69×2	=0.082
3. Plane to $\frac{13}{16}$—0.192×(1÷9)×0.69×2	=0.0295
4. Cut to $41\frac{1}{2}$ inches—0.192×2×(1÷9)×0.69×2	=0.059
5. Edge & rip to $5\frac{1}{2}$—0.3345×2×(1÷9)×0.69×2	=0.1025
6. Move to swingsaw—0.50×2	
7. Set up swingsaw—1.50	
8. Saw to $13\frac{1}{2}$ inches—0.40×(1÷12)×2	=0.0665
9. Move to printer—1.5	

(Continued on page 198)

PRODUCTION DEMANDS

ELIMINATION OF WASTE MOTION

—yet waste is tolerated in most record-keeping systems

Cardineer. . . is an office tool that embodies all of the accepted standards for efficient production— • Operator in relaxed sitting position • All necessary materials within easy reach • All operations performed within the area of maximum efficiency • No lost motion.

Ready for immediate shipment.

Ask for booklet "Cardineer Saves Time and Motion" which shows how the Cardineer principle concentrates the work . . . Also, ask for booklet on "Production." Our Methods Division, Department "F" will assist you in your record problems without obligation. Write

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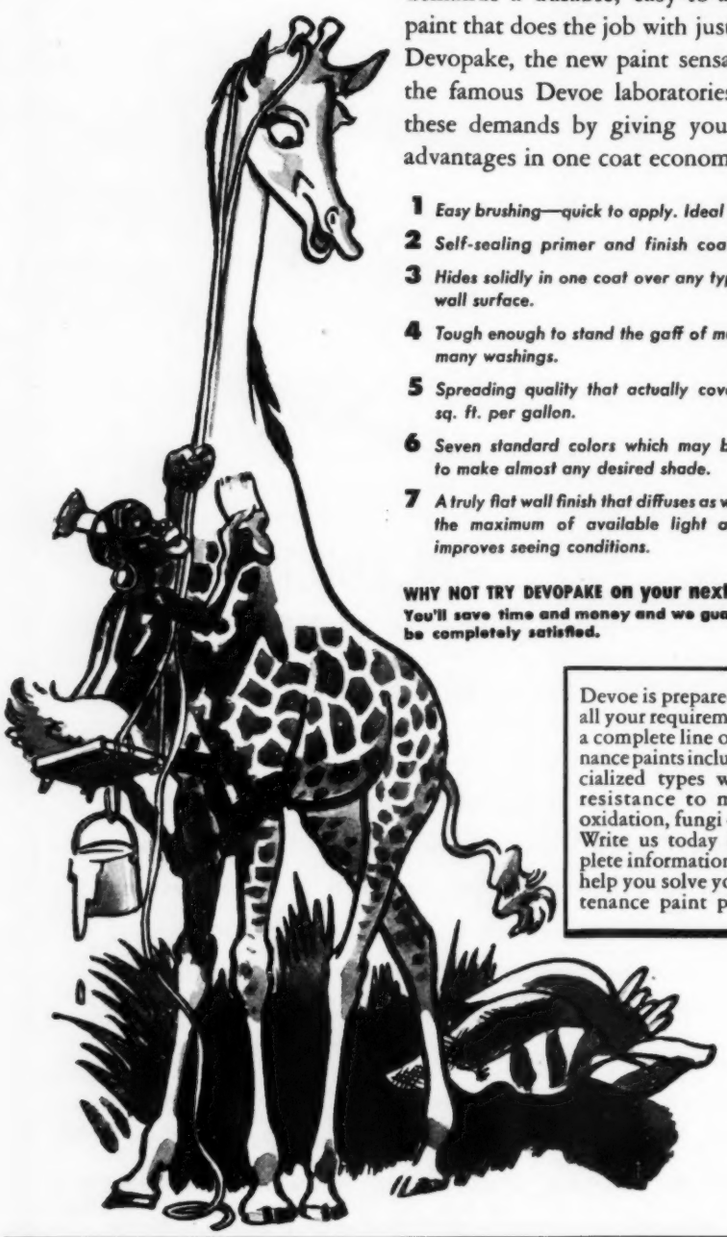
SAFE & LOCK COMPANY • CANTON, OHIO

Astonishing!

HOW DEVOPAKE HIDES AND COVERS ANY SURFACE

"MAINTENANCE"—the watch-word for today when critical materials are scarce and minimum interruptions essential—demands a durable, easy-to-apply wall paint that does the job with just one coat. Devopake, the new paint sensation from the famous Devoe laboratories, answers these demands by giving you *all* these advantages in one coat economy:



1. *Easy brushing—quick to apply. Ideal for spraying.*
2. *Self-sealing primer and finish coat all in one.*
3. *Hides solidly in one coat over any type of interior wall surface.*
4. *Tough enough to stand the gaff of much wear and many washings.*
5. *Spreading quality that actually covers 650-750 sq. ft. per gallon.*
6. *Seven standard colors which may be intermixed to make almost any desired shade.*
7. *A truly flat wall finish that diffuses as well as reflects the maximum of available light and therefore improves seeing conditions.*

WHY NOT TRY DEVOPAKE on your next paint job?
You'll save time and money and we guarantee you'll be completely satisfied.

Devoe is prepared to meet all your requirements with a complete line of maintenance paints including specialized types with high resistance to moisture, oxidation, fungi or fumes. Write us today for complete information that can help you solve your maintenance paint problems.

DEVOE & RAYNOLDS CO., INC.

The 189th Year of the Oldest Paint Maker in America

FIRST AVENUE AT 44TH STREET, NEW YORK, N. Y.

(*Continued from page 196*)

10. Set up for 2-color job—10.0
11. Print—0.0175×2×2 =0.070
12. Move to nailer—1.5

Sides

13. Set up
14. Resaw 2⅛ plank—0.268×(1÷5)×0.268×2 =0.073
15. Plane to 1⅛—0.268×(1÷5)×0.268×2 =0.073
16. Cut to 23—0.268×2×(1÷5)×0.68×2 =0.146
17. Edge and rip to 5 7/16—0.365×2×(1÷5)×0.68×2 =0.199
18. Move to swingsaw—0.50×2
19. Set up swingsaw—1.5
20. Saw to 22 inches—0.60×(1÷10)×2 =0.120
21. Move to printer—1.5
22. Set up for 2-color job—10.0
23. Print—0.23×2×2 =0.092
24. Move to nailer—1.5

Top and Bottom

25. Set up
26. Resaw 2⅛ plank—0.268×(1÷10)×1.69×2 =0.0905
27. Plane to 1⅛—0.268×(1÷10)×1.69×2 =0.0905
28. Cut to 23—0.268×2×(1÷10)×1.69×2 =0.181
29. Edge 23—0.268×2×(1÷10)×1.69×2 =0.181
30. Move to fitter—0.50×2
31. Set up fitter—1.0
32. Fit for 13½ width—0.251×2=0.502
33. Move to matcher—0.50
34. Set up matcher—2.0×3
35. Match for 13½ width—0.205×3×2 =1.230
36. Move to ripper—0.50×3
37. Set up ripper—1.0×2
38. Rip to 22—0.048×2×(1÷2)×2 =0.096
39. Move to resaw—0.50×2
40. Set up resaw—1.0×2
41. Resaw to ½—0.0665×2×(1÷2)×2 =0.133
42. Move to gangsaw—0.50×2
43. Set up gangsaw—1.5
44. Saw to 22—0.09×(1÷5)×2=0.036
45. Move to nailer—1.5

Assembly

46. Set up nailer—5.0
47. Nail side to end =0.430
48. Set up 2nd nailer—5.0
49. Nail bottom =0.215
50. Move tops to aisle—0.50

Total =4.297

Set-up 68.50 =

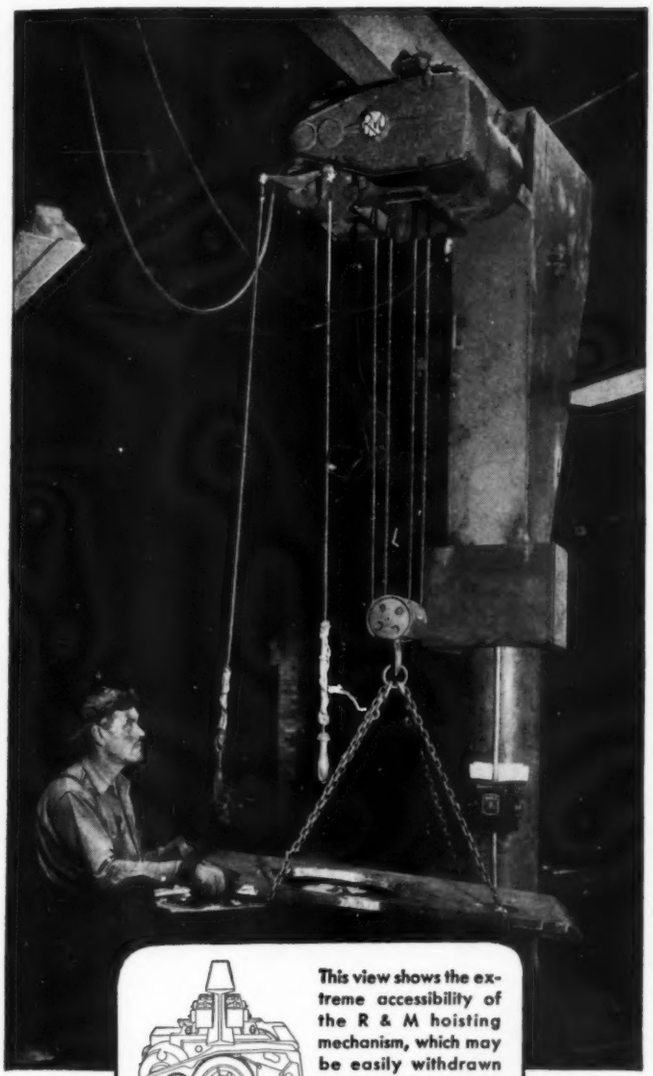
4.297×1.13=4.8 points per case
68.5×1.13=77 points per set-up

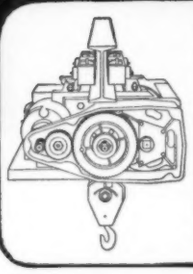
Explanation of Items in Previous Example.

1. Set-up is 4.0 minutes times 2, because of 2 men.

2. 0.268 is resaw time, 2 stands for 2 men. (1÷9) stands for 9 boards 13½ long, that can be cut out of a 130-in. plank. The 0.69 means that the end width of 5½ inches is 69 percent of 8 inches—the average width of a

12 R & M HOISTS Speed this Firm's War Work!





This view shows the extreme accessibility of the R & M hoisting mechanism, which may be easily withdrawn when cover is removed. Note also the compact design that provides low headroom and maximum lift.

What's the fastest, surest, most economical method of handling weights ranging from 50 lbs. to 1500 lbs.? This was the problem that confronted Chicago Vitreous Enamel Product Company's production engineers when they converted to the manufacture of steel and armor plate.

They found the solution—as have engineers in countless war plants—in a fleet of 12 R & M All-Steel Hoists. In their inspection, flame-cutting and testing departments, and throughout the plant, these performance-famous hoists are keeping production *climbing*—with complete safety and minimum maintenance.

Here's why. R & M All-Steel Hoists are precision-built from track to hook; they're powered by famous R & M motors; they're perfectly balanced; they're equipped with an oversize oil-cooled automatic load brake. Hundreds of R & M models, ranging from ½-ton "Davids" to 7½-ton "Goliaths," are available to fit every application.

Whatever *your* hoisting problem, "take it up" with R & M! Our expert representatives will help you find the solution. Call the nearest R & M sales and service office, or write us at the factory.

R & M HOIST AND CRANE SALES AND SERVICE OFFICES

Albany.....364 Broadway
Atlanta.....319 Walton Bldg.
Baltimore, Lombard & Concord St.
Boston.....74 Needham St.
Chicago....2400 W. Madison St.
Cincinnati.....418 New St.
Cleveland..470 Rockefeller Bldg.
Denver.....1420 16th St.
Detroit.....2921 E. Grand Blvd.
Houston..3715 Harrisburg Blvd.
Jacksonville....305 Bisbee Bldg.
Montreal.....Lyman Tube & Supply Co., Ltd.
Newark.....700 Bergen St.
New York.....200 Varick St.
Philadelphia.....401 N. Broad St.
Pittsburgh.....H. W. Oliver Bldg.
Providence.....44 Clifford St.
San Francisco, 116 New Mtgmry. St.
Seattle.....216 Walker Bldg.
Syracuse....204 State Tower Bldg.

ROBBINS & MYERS • INC.

HOIST & CRANE DIVISION, SPRINGFIELD, OHIO • In Canada: Robbins & Myers Co. of Canada, Ltd., Brantford, Ont.

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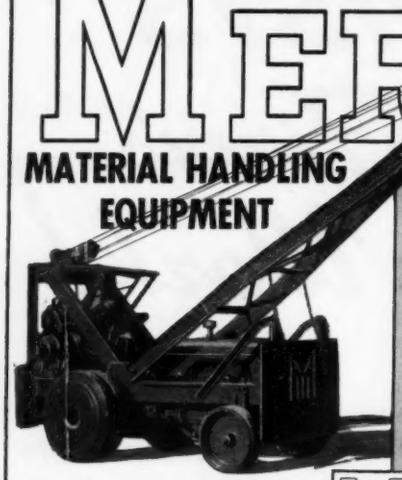
"THE NAME THAT CARRIES WEIGHT"

MERCER

MATERIAL HANDLING EQUIPMENT



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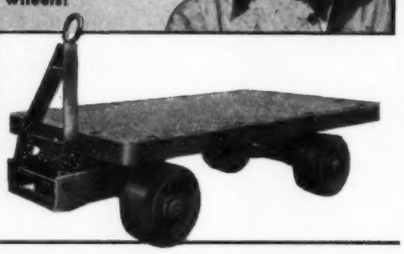
MERCER WHEEL-TRACTOR CRANES make light work of heavy loads... Available in 3 ton, 5 ton and 7 ton capacities. Gasoline-powered. One man operation. Special catalog describes complete line. Write for copy today. ★ Check Mercer first, too, on your TRAILER TRUCK requirements. All types. Capacities from 2 to 35 ton. Literature available.



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SARAN by HODGMAN is a tough thermo-plastic specially made to replace strategic materials. It is adaptable for use under high working and bursting pressures and is resistant to most chemicals. Its ease of handling makes it extremely valuable in installations requiring the transport of oil, gas and corrosive chemicals.

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Send FOR COMPLETE INFORMATION SHEET AND FREE SAMPLE

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plank. The last 2 stands for 2 ends per case.

3. The 0.192 is standard planing time.

4. The 41½ inches is a triple length of 13½. The first 2 stands for 2 men.

5. The 0.3345 is made up as follows: The time for edging a 41½-in. board is 0.0735. Take 75 percent of this because 4- and 5-in. planks are too narrow and amount to 25 percent of all planks. Then rip out 0.96 of a board on the average. Eighty percent of 0.0735 equals 0.0565, ripping time. Time for one board is 0.055 plus 0.0565=.1115. This is multiplied by 3 because there are three 41½-in. boards in a 130-in. plank.

6. The 2 stands for 2 men.

8. The 0.40 is the time for sawing 3 lengths. Saw 4 boards at a time.

11. The first 2 stands for 2 men. The second 2 for 2 ends per case.

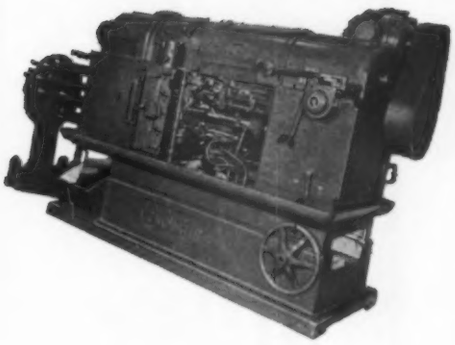
In order to assist group participants in knowing how much bonus, if any, they have earned for any week, the following table should be posted on the bulletin board.

TABLE 11

Pts.	*Percent Bonus*	*Pts.*	*Percent Bonus*
61	0.8	91	25.8
62	1.7	92	26.7
63	2.5	93	27.5
64	3.3	94	28.3
65	4.2	95	29.2
66	5.0	96	30.0
67	5.8	97	30.8
68	6.7	98	31.7
69	7.5	99	32.5
70	8.3	100	33.3
71	9.2	101	34.2
72	10.0	102	35.0
73	10.8	103	35.8
74	11.7	104	36.7
75	12.5	105	37.5
76	13.3	106	38.3
77	14.2	107	39.2
78	15.0	108	40.0
79	15.8	109	40.8
80	16.7	110	41.7
81	17.5	111	42.5
82	18.3	112	43.3
83	19.2	113	44.2
84	20.0	114	45.0
85	20.8	115	45.8
86	21.7	116	46.7
87	22.5	117	47.5
88	23.3	118	48.3
89	24.2	119	49.2
90	25.0	120	50.0

Note—Points will be allowed for each type of case completed. The longer a case takes to make, the more points it is worth. If you can shorten the time through your own ideas or efforts, or reduce the man-hours, the point value will not be changed and you benefit equally with the company by such improvement. Point values which seem out of line should be reported to your foreman, who will take steps to remedy such discrepancy.

Base rates should be equivalent to



No pause need refresh them

When time, space and manpower are precious, the tireless performance of fast, dependable multiple spindle automatics is appreciated.

Although machines may not tire, their operators often do. Simplicity and convenience of operation are important factors of a good machine.

The Departmental Design of a Conomatic contributes much to its efficiency and ease of operation. The tooling area, work-head, overhead camshaft, and controls, are in orderly arranged units, conveniently accessible from either side of the machine.

These conveniences contribute to the effective results that good operators are getting from 4, 6 and 8 Spindle Conomatics.

Prime your production pulse by specifying CONES.

Cone Automatic Machine Co., Inc., Windsor, Vermont

TAKE A TIP ON

DUST CONTROL

● "Pardon, sir, just look at the dust coming out of your plant. If I'm not too forward, sir, I've been reading about Dust Control in some of your magazines. They say PANGBORN does an excellent job, sir."

● Follow that tip, mister, because Pangborn *does an excellent dust control job!* For more than thirty years both large and small industries have ended their dust problems by using Pangborn all steel, cloth screen Dust Collectors.

● If you want your dust trapped at its source and deposited in hoppers ready for final disposal, if you wish to salvage valuable raw products now being lost in the atmosphere as dust, or if you want to improve working conditions for your employees—COME TO PANGBORN! This tip is worth acting upon at once. Write or wire.

PANGBORN

THE WORLD'S LARGEST MANUFACTURER OF DUST CONTROL AND BLAST CLEANING EQUIPMENT

PANGBORN CORPORATION · HAGERSTOWN, MD.

previous hourly earnings, so that a bonus will be earned for any improvement over the present. The processing timetable should not discount the future, but should be truly a story of the present. This is important in order to keep up morale and effort.

Other Applications. Recently we have installed the point per man-hour group incentive in the gun-action proving room, the brass-casting shop, and the radiator-tube shop. The steps for installation are as follows:

1. Processing timetable of shop as is.
2. Classification and base rate table, showing ratio of man-hours per day to productive hours.
3. Determine point value from (1) and (2) above.
4. Work simplification program with group to effect changes in (1) above.
5. No points are credited until work is completed and has passed inspection for quality, so that incentive is based on productivity and quality.

Summary. For years, we have been offering incentives for direct employees, but we have neglected the machine adjuster, the helper, the tool setter, etc. In the above incentive plan, all employees except inspectors are included, and it has made for teamwork. The adjuster now feels that it is his duty to encourage and instruct operators and to keep up quality, because it affects his weekly take.

Results of these group incentives have been encouraging. Earnings by bonus have averaged from 8 to 35 percent for various groups, and the men are enthusiastic. Men are not added to the group unless they are absolutely needed, because the group realizes that extra man-hours without corresponding output, penalizes the group.

Problems With Female Help

(Continued from page 88)

reach. Will the assembly layout have to be compressed a bit to adjust for this?

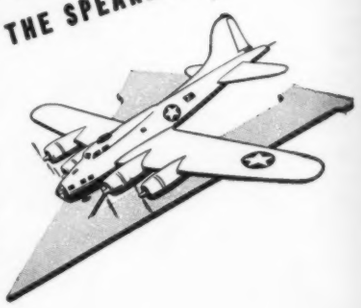
19. Women's knee and hip joints are different. Levers or treadles should be as much like the automobile accelerator pedal as possible, allowing the heel to rest on the floor.

20. How about having the company physician or nurse check with those girls who show signs of fatigue, or odor, during certain periods?

21. Women become hungry be-

Metal Shapes-

THE SPEARHEAD OF VICTORY



Every minute counts today in the production of America's high-flying, hard-hitting war machines . . . and all her other fighting equipment. Yes, time counts now, including all the time spent by Yankee workmen at their benches and machines in the past century — a vast background of metal-working experience that is proving a priceless heritage in solving today's production problems.

Working all-out for the war effort, RITCO is using its long experience to utmost effect.

SPECIAL BOLTS, NUTS and STUDS
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SCREW MACHINE PRODUCTS
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SPRAYED METAL SERVICE

Estimates gladly submitted. Send samples or blueprints. Catalog on request.

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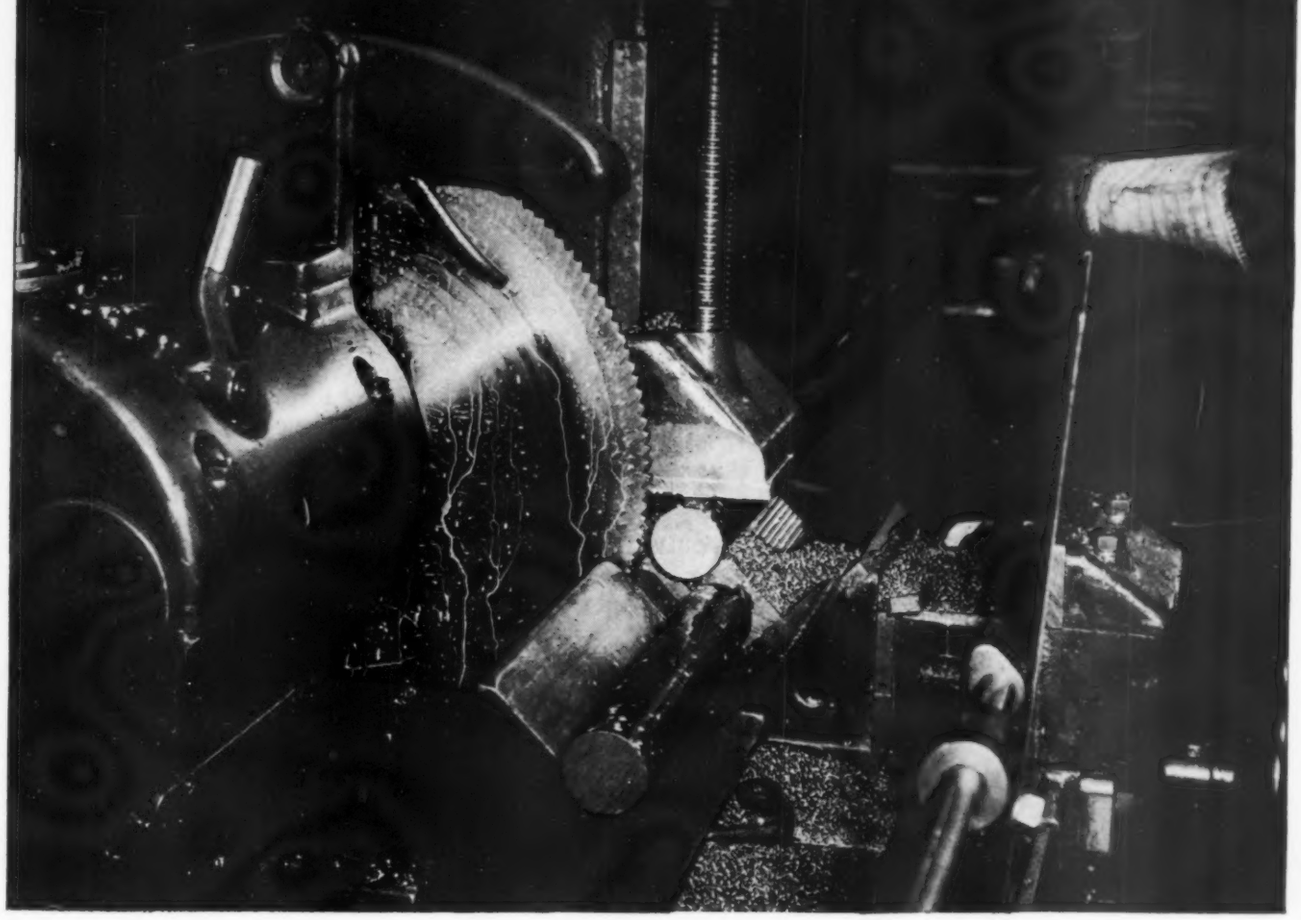
Serving American Industry Since 1834

RITCO

ATKINS *Curled-Chip* SAWS



Best for War Work Because They

TAKE LESS TIME FOR "TIME-OUT"

● The production loss caused by tool change-overs is one of those "necessary evils" that plague war plant production managers. It is no wonder, then, that Atkins Curled-Chip Saws have come as a god-send to shops and factories hard pressed for more and more output.

The capacity of these saws for sustained cutting without re-sharpening is tremendous. On armor plate, copper, brass, aluminum, iron, steel or any other metal, curled-chip teeth are on record as cutting double, triple and even more material between saw change-overs. In addition they take a deeper bite of metal than was practical hitherto, cutting with greater accuracy on shell stock, shell bands, gun mounts and many other armament parts.

For full data on these production-boosting saws, write for information on Atkins Engineered Cutting Service.

E. C. ATKINS AND COMPANY
445 S. Illinois St., Indianapolis, Indiana

ORIGINATORS OF THE *Curled-Chip* SYSTEM OF METAL CUTTING

Vest Pocket Size

Right Triangle on reverse side

This Amazing Chart

Makes

TRIGONOMETRY **EASY**

40 TRIGONOMETRIC EQUATIONS quickly found on TRIG-EASY CHART. All errors through use of wrong equations eliminated. Angles and dimensions determined without knowledge of higher mathematics.

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With TRIG-EASY, every man whose work requires solution of problems involving angles, saves HIS time and time for those who must WAIT for calculations. TRIG-EASY quickly gives you the answer on jobs requiring machine surfaces, holes drilled at angles, etc. Pays for itself in time saved every time it is used. You save calculating time with instant correct equations. Grease-proof and sturdy to resist moisture and dirt. Over 18,000 in use by many of the largest concerns in U.S. and Canada.

TRIG-EASY costs only 50c with complete instructions and MONEY-BACK GUARANTEE. You can speed production thru education of personnel. Send for TRIG-EASY CHART today.

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A large aircraft manufacturer writes: "Krane Kar is used in the production of Flying Fortresses: handling jig sections in erection; handling steel for jig sections; unloading equipment from flat cars; loading aircraft spare parts and assemblies on cars; placing large pieces of production equipment and handling repair parts for same when necessary; lifting, moving, and rearranging production equipment, raw materials, etc.; for building maintenance and repair, etc." Write for details.

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Kranekar SWING BOOM TRACTOR CRANE 2½, 5 & 10 TON CAPACITIES

SILENT HOIST WINCH & CRANE CO., 855 63RD ST., BROOKLYN, N.Y.

tween meals more often than men do; canteen adjustments may need to be made. And how about stocking it with refreshments more in line with the "hidden hunger" (the often unrecognized desire for nourishing, vitamin-rich food) dietary needs?

22. Women are more sensitive to the temperature of their working environment. Wonder if we should check with the air conditioning people?

23. Women can't take kidding, joshing, teasing. Better let the supervisors know that, hadn't we?

24. They say women are not as adapted to teamwork. Will this be a disturbing factor in some of our production groups?

25. What's this we hear about women resenting being bossed by another woman? Should we hew to the policy of men supervisors for women?

26. And is it true that women are likely to respond adversely to a production contest?

27. Should the supervisor be considerably older than the women?

28. Cliques — and crushes — rear their ugly heads more with women workers. How are we going to handle them?

29. Some incentive payment plans are especially disheartening to women. Will ours be?

Are we going to let the need for some minor adjustments on our part prevent us from keeping up peak production in these days of national emergency? We are *not*—not if we can see the handwriting on the wall!

Significant Labor Developments

(*Continued from page 113*)

Federal District Court, establish reasonable ground for charging a violation. In short, he may not embark on a "fishing expedition." (Walling vs. Mississippi Road Supply Company.)

Reimbursement for Increased Wages Denied

The Comptroller General denied reimbursement to a fixed-fee contractors for wages above the Davis-Bacon scale paid by a lump-sum subcontractor. When the subcontractor made his bid, reasoned the Comptroller, the cost of labor was a large factor in his price. Since he presumably intended to pay rates higher than the

"...do it the *Electronic Way!*"

BETTER . . . FASTER . . . MORE ECONOMICALLY

Every day, throughout industry, RCA Tubes in modern Electronic equipment are helping replace both mechanical and human operations on a wide variety of tasks. Every day, they are making possible new standards of accuracy, efficiency, and economy—higher than are practical or feasible by any other method.

So far-reaching has been this industrial development of the Vacuum Tube, it is now the rare industry which does not already utilize various Electronic methods—or, by the same token, stand to benefit by the adoption of many more.

"Do it the Electronic Way" is far more than a slogan. It is a direct challenge to every business that has exacting work to be done still more exactingly.

The Electronic Way has few or no mechanical limitations, is often more economical, and provides freedom from the annoying element of human error!

As the acknowledged leader in the pioneering of Tubes for Radio, it is only natural that RCA should also lead the way in the design of Tubes for industrial uses. A wide variety of types, each with a background of proved dependability, affords a broad engineering selection. Write for Power and Special Tube Folder TT-100, or Phototube Folder PT-20RI to Commercial Engineering Section, RCA Manufacturing Co., Inc., 5th Street, Harrison, N. J.

RCA *Tubes* FOR INDUSTRIAL EFFICIENCY

Low Power • Medium Power • High Power • Cathode Ray • Phototubes
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CREATING *New* MACHINES *out of Thin Air!*

That's Just What Happens When You Equip Your Machines

WITH **SERVIS RECORDERS**

This merely means: Getting more work out of the machines you already have. It's that simple. But it runs to enormous savings.

The Story of The Day's Work

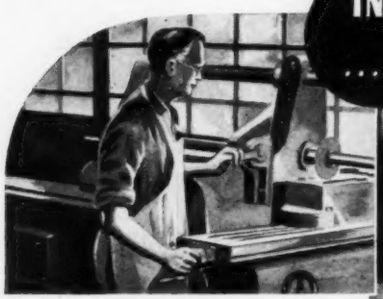
ONE POUND OF SERVIS RECORDER can and often does save more than HALF A TON OF MACHINERY! It's being done today, not to save gold, but to save steel. Big war orders tell us that.

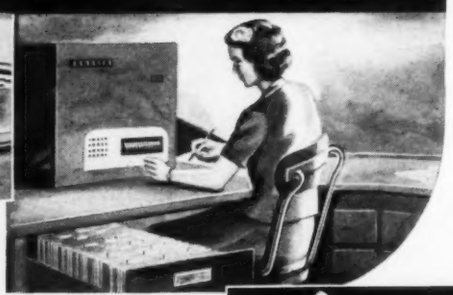
Send for our folder— "A Busy Plant"

THE SERVICE RECORDER CO.
1375 Euclid Ave., Cleveland, O.

The Servis Recorder
The "Time Clock" for Machinery

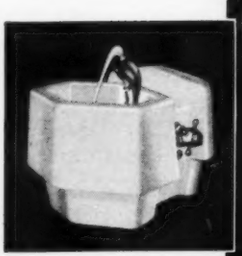
IN EVERY DEPARTMENT
...convenience counts

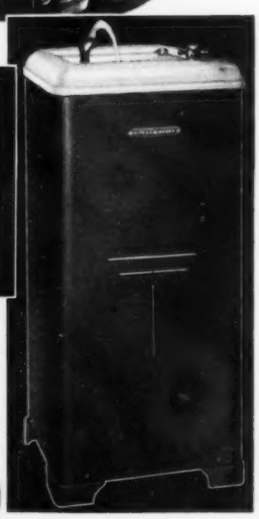




Conveniences are as vital to maintaining increased production as the metals and machinery . . . conveniences which promote the comfort, health and safety of the worker! In this field Halsey Taylor Coolers and Fountains play a prominent role, with features that promote sanitation and health protection. Write for catalog.

The Halsey W. Taylor Co.
WARREN, OHIO





HALSEY TAYLOR
AUTOMATIC STREAM CONTROL • TWO-STREAM PROJECTOR
DRINKING FOUNTAINS

Davis-Bacon minimum, payment of the full subcontract price would make the government bear the cost of the increased wages.

Employment of Girls Under 18 Permitted

By ruling of the Secretary of Labor, girls under 18 may now be employed under public contract and in manufacturing and mining provided that the occupation is one which, in the opinion of the Chief of the Children's Bureau, is not particularly hazardous or detrimental to the health or well-being of children under 18.

The exemption granted by the Secretary of Labor, however, provides that no girl under 16 shall be employed, no girl under 18 shall be employed for more than 8 hours in any one day or between the hours of 10 p.m. and 6 a.m., or in any way in violation of state laws governing hours of work. The contractor must obtain and keep on file a certificate of age for every girl under 18 in his employ.

Contracting Officers Bound by Eight-Hour Law

While Congress has authorized contracting officers to negotiate contracts "notwithstanding the provisions of any other law," this broad provision does not authorize them to suspend the Eight-Hour Law. Congress, ruled the Comptroller General, did not intend that all laws which might be applicable to the procurement, manufacture, and transfer of defense articles could be waived, suspended, or disregarded by administrative departments in their discretion, but only those whose provisions otherwise might prohibit or unduly interfere with the carrying out of the purpose intended to be accomplished by the War Powers Act—namely, the manufacture and procurement of defense articles and the sale, transfer, lease thereof, to countries whose defense the President deems vital to the defense of the United States.

WAR LABOR BOARD

** WLB Broadens Its Jurisdiction*

WLB has widely extended its jurisdiction to all industries, war and non-war.

In ordering Montgomery Ward to comply with WLB's ruling as to union maintenance, the President in effect grants authority to settle all disputes throughout all industry.

In two other cases WLB extends its sphere over finance companies,

* In this and the following classification items marked with an asterisk also are considered to be trend indicators.

Dust-tight Panelboards

are a MUST

in dust-laden atmospheres

Guard against explosions that might be set off by exposed arcs. Play safe! Install

(FA) DUST-TIGHT PANELBOARDS

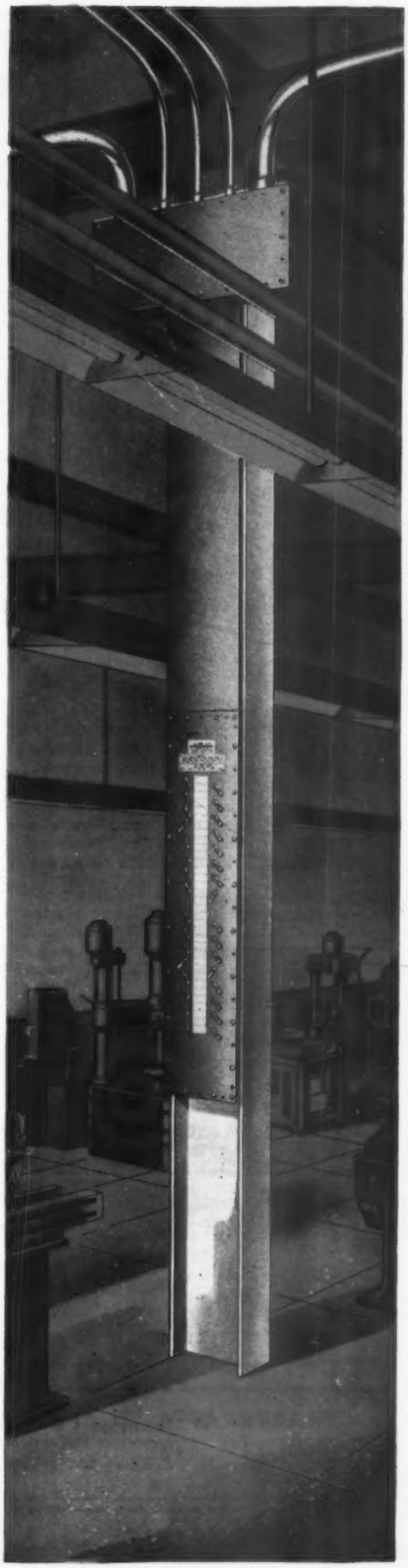
Above: Standard type (FA) Dust-tight Panelboard and cabinet for wall or exposed column mounting. (12" or 15" wide, as required.) At right: Column type (FA) Dust-tight Panelboard and cabinet, with wireduct and pull box. Ideal for 8", 9" or 10" H column mounting.

Underwriters' Laboratories, Inc., have approved them for "Class II, Groups F and G, Hazardous Locations." They are ideal equipment in atmospheres containing carbon black, coal or coke dust, or grain dust. In shell loading plants, coal mines, coal processing plants and grain mills, they are proving a vital protection.

Instead of the usual steel front with door, this panelboard has a solid steel front plate, gasketed all 'round, and secured with screws to the extra wide box flange. It is further rendered dust-tight with welded hubs for conduit outlets, welded box-corners, and handle bushings riveted directly to the steel cover plate. External mounting brackets are provided to maintain the dust-tight construction.

The circuits are externally operable by a mechanism of new (FA) design. The handles operate through dust-tight bushings, and engage the regular handles of the circuit breakers inside the cabinet. ON and OFF positions are indicated on the front of the cabinet.

The (FA) Dust-tight Panelboard may be had in standard type, or in narrow column type. It is of the circuit breaker type, with either the new (FA) Type AC Thermag or (FA) Dublbrak circuit breakers (or other types of lighting branch-circuit circuit breakers) . . . Capacities: 50 amperes or less, for 3 wire, single phase, or 4 wire, 3 phase mains, with lugs only. Available with 4 to 42 circuits . . . Frank Adam Electric Company, St. Louis, Mo.



EST. 1891 — THE SIGN OF A BETTER JOB

Frank Adam

ELECTRICAL PRODUCTS

for War Industry

FRANK ADAM ELECTRIC CO. ST. LOUIS, MO. U.S.A.

(FA) Electrical Equipment includes: Busduct, Wire and Cable Duct, Service Equipment, Panelboards, Switchboards, Safety Switches, Knife Switches, Floor Boxes, Fan Hanger Outlets, and related equipment.

HERE'S AN OLD TRADEMARK WITH A NEW PRODUCT

Your friend "Long Life"* now brings you ARTKRAFT Hot Cathode Fluorescent Lighting!

● Lamps guaranteed 3,000 hours (Rated 5,000 to 6,000 hours)...No starter switches ...Operates efficiently at 85 to 135 volts...Don't confuse with so-called quick lighting high voltage systems or cold cathode lighting.

SIGNS* OF LONG LIFE

This registered Trademark of The Artkraft Sign Co., the world's largest manufacturer of all types of signs, (now engaged 100% in war work) has always kept good company. Artkraft for years has served the outstanding names in American business—such as J. C. Penney Co., U. S. Tires, Pittsburgh Paints, and Shell Oil to name only a few.

Artkraft, with its four affiliate plants occupies almost a half-million square feet of floor space and employs 1600 craftsmen. This strong institution is your permanent assurance of ready lamp replacements.

WHOLESALERS:
Write for our proposition.

FIXTURE MANUFACTURERS:
Write for details on constant voltage manufacturing license.

Here's Why They're Switching To ARTKRAFT

- 3,000-HOUR LAMP GUARANTEE. Rated 5,000 to 6,000 Hours.
- NO STARTER SWITCHES. Artkraft resonant starting eliminates this trouble-maker.
- CONSTANT VOLTAGE POWER PACK. Gives efficient operation at 85 to 135 volts. Can also be used on 220— and 440-volt systems, single or three-phase. Cannot short circuit the line.
- 100% POWER FACTOR at rated voltage. 98% or over within 85 to 135-volt range.
- "EASY MOUNT" LUMINAIRE ALLOWS INSTANT REMOVAL WITHOUT TOOLS, FOR CLEANING NON-FERROUS REFLECTOR OR LAMPS.
- CONSTANT TEMPERATURE HOT CATHODES. Light at 40° below zero, operate efficiently at low temperatures.
- STROBOSCOPIC (FLICKERING) EFFECT REDUCED.
- MORE LIGHT FOR THE SAME CURRENT.
- FIELD TESTED UNDER ADVERSE CONDITIONS FOR OVER FIVE YEARS.
- MODERATE FIRST COST. RADICALLY REDUCED MAINTENANCE COST. Lamp replacements are less frequent, starter replacements eliminated, ballast replacements unknown, man-hours saved by making these replacements unnecessary.

Free! NEW ILLUSTRATED CIRCULAR USE THIS COUPON

ARTKRAFT SIGN CO.
1110 E. Kibby St., Lima Ohio.
Please send without obligation your new profusely illustrated circular F102—
Have qualified Artkraft Fluorescent Lighting Engineer call—
Name..... Position.....
Firm Name .....
Address .....

ARTKRAFT HOT CATHODE FLUORESCENT LIGHTING
Division of The Artkraft Sign Company
General Offices: 1110 E. Kibby St., Lima, Ohio, U. S. A.

LONG LIFE DEPENDABILITY

despite the claim of one (J. S. Bache) that since it has no part in war production WLB is without jurisdiction. (Security Title & Guaranty Co.)

The latest contest involves municipalities, specifically New York and Newark, which claim that since cases are civil service, the cities have no choice in the selection of the employees and hence should not be required to submit to WLB.

In discussing its jurisdiction, WLB held that while the Labor Relations Board has sole authority to decide matters of recognition and unfair labor practices, the WLB has final authority to order procedure pending decision on these issues so as to allay employee unrest and avert work stoppages. (Baltimore Transit Company, Western Cartridge Company.)

* *Little Steel Formula Prevails*

WLB has announced that it will continue to approve wage and salary increases where rates have lagged behind the 15 percent increase in the cost of living, where inequalities and gross inequities exist, and where the rates are substandard.

It emphasized, however, that it will not act independently to control the flow and movement of labor by approving wage or salary adjustments, although it will cooperate with the War Manpower Commission.

* *Overtime Not Included in Base Pay*

In determining whether an increase is to be granted in conformity with the Little Steel formula, WLB has ruled that the regular rate of pay, not earnings which include overtime, is to be considered the base pay. (L. Martin Company.)

* *OES Sanctions Increase*

In its first decision in a specific case, OES approved WLB's order increasing by $1 per day the wages of copper, lead, and zinc workers, to prevent labor piracy.

WLB to Approve Increases Prior to November 7

To mitigate the hardships resulting from the Stabilization Order, WLB ruled that if the employer granted an increase in wages or salaries prior to November 7 without the approval of the Board, he may petition for such approval to be granted retroactive to the date of the increase.

* *WLB Equalizes Wage Rates*

WLB equalizes wage rates in adjoining plants even though the union representing employees in the adjoining yard was not represented at the proceedings. Failure to equalize the

rates, ruled the Board, would only aggravate the rivalry. (Lever Brothers.)

Wage increases and check-off provisions were also granted to employees of Penn Iron & Steel Corporation and Wyckoff Drawn Steel Company to correct sectional inequalities.

WLB approves increases for telephone workers (Bell Telephone Company), New York, and San Francisco hotel employees (Hotel Association of New York City, Employers Association of San Francisco), steel employees. (Wheeling Steel Corp.)

Reason for Granting Increases

WLB grants increases not to prevent labor migration, but to adjust rates to the increased cost of living. In one case, the Board approved wage increases of varying amounts for employees of a company whose basic rates had increased by nearly five times the 5 percent limitation under the cost-of-living formula. (Endicott Forging & Mfg. Company, Tyer Rubber Company.)

It has steadily sidestepped making any ruling on what constitutes substandard wages and would warrant the granting of an increase.

** WLB Continues to Adhere to Its 15 Percent Formula*

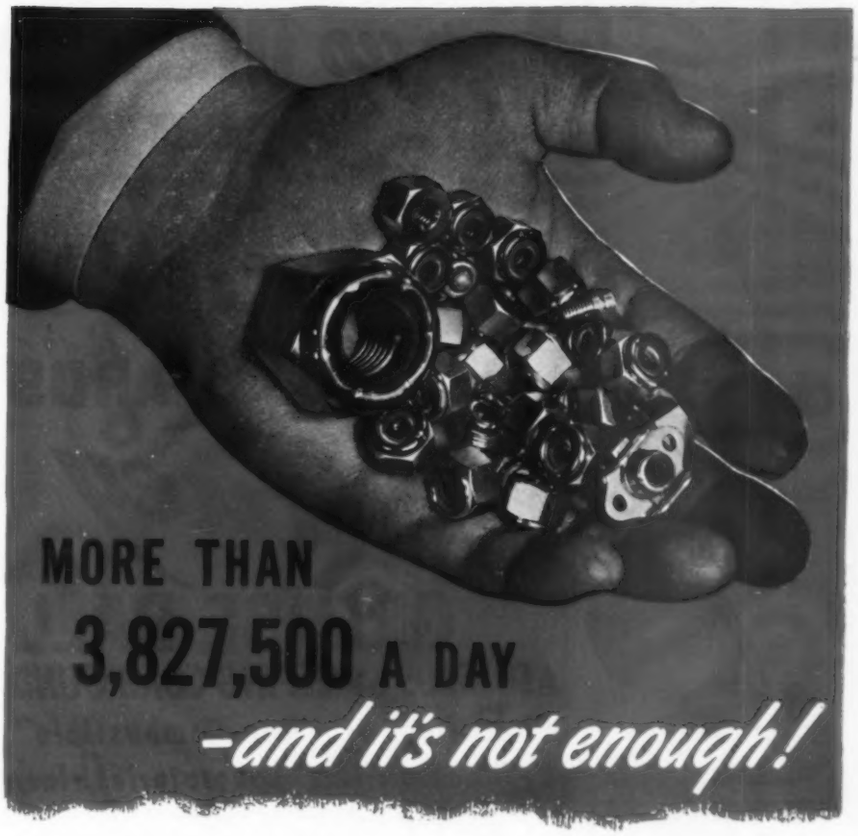
In an effort to comply with its 15 percent formula, WLB modified an escalator clause in a collective bargaining contract which provided for automatic wage increases whenever the cost of living rose by a designated amount. The Board refused to approve the increase on the ground that it would raise the wages more than 15 percent above the level of January 1, 1941. (Pyrites, Inc.)

In another case, the Board denied such an increase even though local living costs in the area involved had arisen more than 15 percent. (Hotel Employees Assn. of San Francisco.)

** Stabilization Rulings*

Treasury announced its stabilization program, ostensibly to dovetail with that of WLB. WLB assumes jurisdiction over all wages and over salaries below $5000, provided the employee is the subject of a *bona fide* collective bargaining agreement and is not a *bona fide* executive, administrative, or professional employee. Treasury has jurisdiction of those over $5000, and the commissioner assumes jurisdiction over those under $5000, who are *bona fide* professional, executive, or administrative employees and who are not represented by a labor organization and whose services are not agricultural labor.

As for the bonus, WLB allows payment of a customarily paid bonus



EVERY single day almost four million Elastic Stop Nuts go into war production.

Even at that, and with all our expanded plant, it doesn't fill the demand.

It happens that the most urgent need right now is on aircraft. Every American plane that takes the air has some important part of its structure fastened with these strong, tight-holding nuts. Some types take as many as 35,000 in a single ship.

The reason is: *these nuts stay put under the toughest circumstances.*

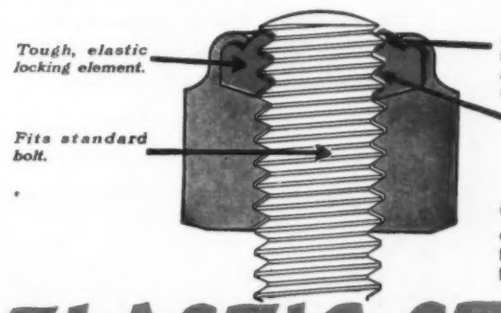
You handle them exactly like regular nuts. They go on fast, lock immediately and automatically.

There's no need of pins, washers or auxiliary locking devices.

Once on, they stay there—never shake loose. But you can take them off and put them back on many times and they won't lose their locking ability.

This is why there are more Elastic Stop Nuts on America's planes than all other lock nuts combined. And why they are also used in important structural applications on guns, naval vessels and other war equipment.

We have made billions of Elastic Stop Nuts and, as far as we know, not one has ever loosened.


Tough, elastic locking element.
Fits standard bolt.
Seals threads at top—prevents corrosion of working threads.
Locking collar cannot harm the bolt threads.

Write for folder explaining the Elastic Stop self-locking principle.

ELASTIC STOP

SELF-LOCKING NUTS AND AIRCRAFT FITTINGS

ELASTIC STOP NUT CORPORATION
2330 Vauxhall Rd., Union, N. J.

WITH THE RED COLLAR—SYMBOL OF SECURITY

Sweep up OIL and GREASE THIS EASY Safe WAY!

ELIMINATE FIRE HAZARDS

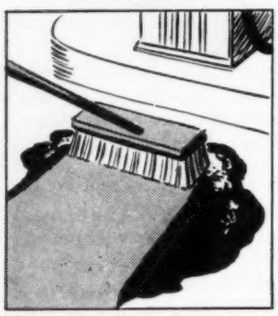
Carey

GREASE BALL

ASBESTOS SWEEPING COMPOUND

Classified as "Non-Combustible" by Underwriters' Laboratories, Inc.

NON-COMBUSTIBLE — Compounded entirely of non-burnable materials.



ABSORBENT—Soaks up oil and grease.

ECONOMICAL—Inexpensive; reduces cleaning costs. Available in 50-lb. bags.

Here at last—a sweeping compound that efficiently removes oil and grease deposits, yet does not create a fire hazard. Absorptive action; mildly abrasive. The ONLY product of the kind on current Underwriters' re-examination list classified as "Non-Combustible." Contains no acids or caustics; will not damage floors or injure shoes or clothing. Lessens accidents due to falls. Widely used in metal working, chemical and food plants, refineries, power plants, garages, filling stations, etc. Very economical—may be re-used until thoroughly oil soaked. Write for free sample and full information to Dept. 31

THE PHILIP CAREY MFG. CO.

Dependable Products Since 1873

LOCKLAND, CINCINNATI, OHIO

In Canada:
The Philip Carey Company, Ltd.
Office and Factory: Lennoxville, P. Q.

HARMLESS—Contains no acids or caustics. Will not damage floors or shoes.

NON-SKID — Removes danger of accidents and possible law suits.

without approval provided that: (1) If it is a fixed amount, it must not exceed the amount paid during the preceding bonus year, and (2) if it is computed on a percentage, incentive, or similar basis, the method of computation and rate must not be changed to yield a greater amount than during the preceding bonus year, although an increase in amount is permitted if arrived at by the customary computation rate.

The Treasury permits bonus payments without approval if (1) the amount paid does not exceed that paid in the previous bonus year, or (2) the bonus is a fixed percentage of the employee's salary and is no higher than in the previous year.

** Increase Denied*

WLB refused an increase to prevent migration of workers from a chemical processing company to a nearby munitions plant since according to the Board there were no maladjustments, inequities, or substandard wages to justify the raise. (Staley Manufacturing Company.)

Refusing to follow the Little Steel formula, WLB rejected a requested increase on the ground that the effect thereof would be to "unbalance the area rates." (Smith & Wesson, Inc.)

In application of the Little Steel formula, WLB denied an increase to glove workers whose wages kept apace of the cost of living and were higher than those paid in other major glove manufacturing centers. (National Association of Glove Manufacturers.)

The Board also refused to make retroactive as of the date of the Little Steel formula (July 15, 1942) wage increases already granted employees of a metal products company. (Stevens Metal Products Company.)

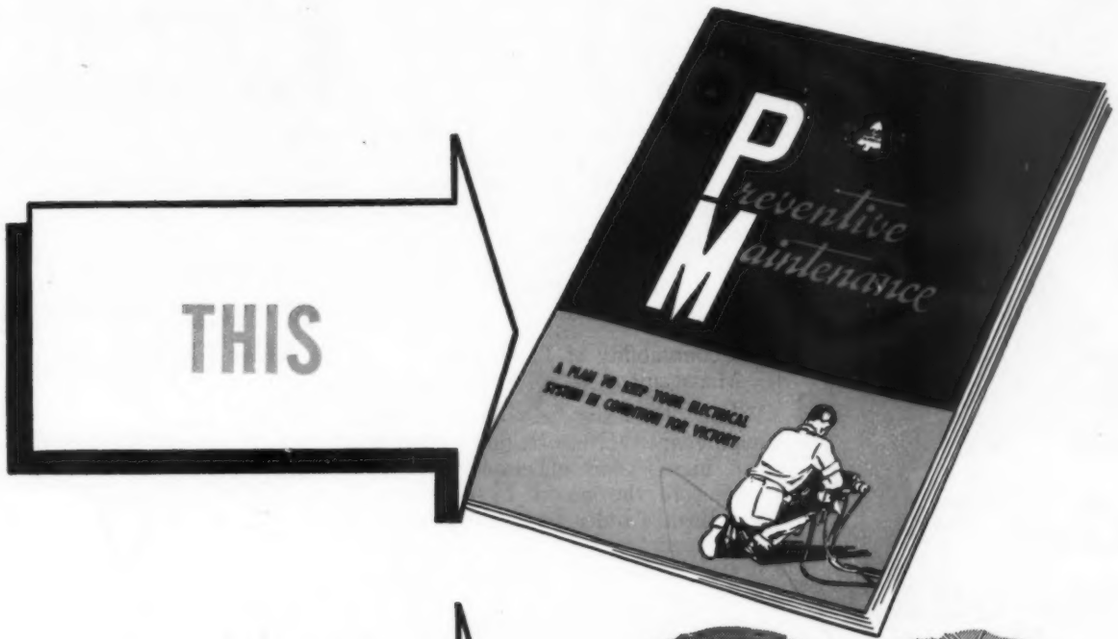
WLB rejected an increase to prevent labor piracy despite the fact that the increase, jointly petitioned by labor and management, was for the specific purpose of attracting labor urgently needed to meet the delivery schedule of a Navy contract. An increase of 9 cents an hour was requested; an increase of only 4½ cents was granted. The inducement, an additional 6 cents, if necessary to attract sufficient labor, was flatly disallowed. (Joy Manufacturing Co.)

WLB again deviated from the Little Steel formula. No increase was allowed, even though only an 8 or 9 percent increase in wages had been granted since the base date. The board justified its refusal on the ground that to grant it would create a new inequality. (Lever Bros.)

** Strike Penalty in Labor*

WLB penalized a union for calling

Tomorrow may be too late—do it NOW



WARTIME restrictions make copper products hard to get — this includes electrical wire and cable. It will pay you to protect what you have.

Anaconda's Preventive Maintenance Plan will help you check to see that cables in your plant are not being abused.

If you follow this free plan you not only help yourself, but more important, you help the war effort. This manual provides a practical automatic method for complete analysis of circuits and equipment... uncovers potential weaknesses ... methods for correcting them ... with charts to enable quick periodic check-ups.

NOTE: Through this Preventive Maintenance Plan you may uncover the evidence necessary to obtain an "emergency repair priority." This is explained fully in the plan book.

43226

ANACONDA'S PREVENTIVE MAINTENANCE PLAN

ANACONDA

Anaconda Wire & Cable Company
25 Broadway, New York City

Please send copy of the Anaconda Preventive Maintenance Plan for safeguarding production.

Individual .....

Company .....

Address ..... City .....

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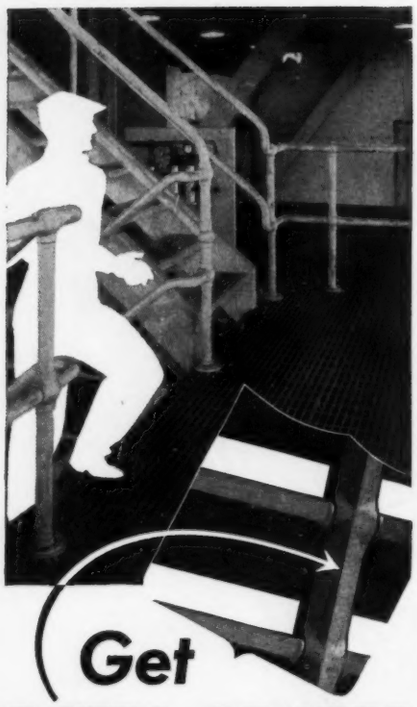


Get
BATES-GRATES
FOR YOUR OPEN STEEL FLOORING AND YOUR FLOORS, TOO, WILL BE CLEANER AND SAFER

See that scraper tread—and the crisp lines of the Hex cross bar? *That* gives a safer and cleaner tread and at the bottom of those cross bars you find clean, well-shaped fillets made by the metal displaced in the Bates patented process—no metal is lost. The weld is cleaner and stronger. The *floor* is cleaner and stronger. Yet, open steel flooring made under Bates patents costs no more.

Write for 8½ x 11 booklet that explains all details and shows many fine installations.

WALTER BATES COMPANY, INC.
208 S. LA SALLE STREET • CHICAGO, ILLINOIS
OPEN STEEL FLOORING • STAIR TREADS

a strike by depriving it of a membership maintenance clause. (East Alton Manufacturing Company.)

But the Board refused to enforce the penalties against strikers imposed by their contract. (Jones & Laughlin Steel Company.)

* *Policy on Strikes*

WLB has warned that: (1) No employer may provoke a union to strike and then expect the Board to deny the union any form of security; (2) any union which brings about a strike which appears to be a spontaneous work stoppage may expect harsh treatment by the Board.

* *Accountability of Labor and Management*

While the standard membership maintenance clause requires continued membership of employees who belong to the union 15 days after the Board's order (escape period) it now guarantees the right of employees *not* to belong to a union by barring union constitutions from preventing the use of such escape clauses.

The Board also prohibits employers from influencing employees to withdraw from membership. (East Alton Manufacturing Company.)

* *Maintenance of Membership Granted Despite Strike*

WLB granted maintenance of membership despite the fact that the union's members engaged in a strike and slowdown, in view of the fact that the strike, which was unauthorized, was induced by the goading of non-members and delinquent members of the union, who claimed that non-members got as much from the company as members. Furthermore, union leaders persuaded the employees to return to work and offered to have them make up the hours lost at straight time, but the employer declined the offer. The alleged slowdowns were not brought to the attention of the union leaders until the case came before the Board. (Ralston-Purina Company.)

* *Compulsory Arbitration Ordered*

WLB ordercd a permissive arbitration clause to be suspended by a compulsory clause in the renewal form of a contract despite the employer's claim that an arbitrator would be unable to appreciate the discipline of so hazardous an occupation.

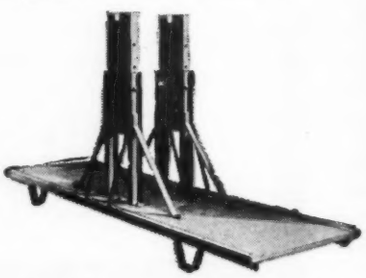
The Board pointed out that the employer was sufficiently protected by the withholding of a union security clause until the union had established its responsibility. (East Alton Manufacturing Company.)

(Continued on page 214)

HANDLING SIMPLIFIED AT LOW COST

A COMPLETE LINE OF SKIDS, PLATFORMS AND FLOOR TRUCKS

A completely assembled "Ironbound" skid with flush angles and countersunk bolts. Designed for greatest operator safety and long hard usage. Will handle loads up to 20,000 pounds.



Specially designed "Ironbound" superstructure for carrying shafted objects such as armatures, motors, etc. Notice the flexible bearing arms which can be lowered or raised in the heavy steel channels.

★"Ironbound" materials handling equipment is built to give great service-life under "rush" conditions. Ample protection to both operator and materials being handled is assured thru the various improved construction features. Available immediately are the standard types, and specially built units can be had on short notice. Illustrated literature is available on request; write today.

IRONBOUND BOX & LUMBER CO.
30 HOFFMAN PLACE HILLSIDE, N. J.

IRONBOUND SKIDS
AND MATERIALS-HANDLING EQUIPMENT

COMMUNIQUE
Rubber is fighting a continuous battle on a front extending across five continents and over seven seas.
It is the hardest pressed of all materials engaged in the conflict.
It will win its battle, but not without difficulties that will engage its full fighting power for some time to come.
Dislocation of its ordinary life and pursuits is widespread, but is unavoidable if the ordinary life and pursuits of the nation are to be defended and restored.
It is our aim to do everything possible toward the achievement of ultimate victory.
BOSTON WOVEN HOSE
TRADE MARK
AND RUBBER COMPANY
BOSTON WOVEN HOSE AND RUBBER COMPANY
CAMBRIDGE, MASS.

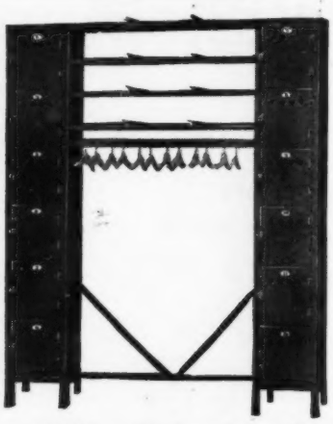
More Tons per Hour

WITH AN I. B. BUCKET

Properly designed—as a result of over 50 years experience—Industrial Brownhoist buckets are light in weight yet of extra sturdy construction. Large sheaves reduce rope wear and maintenance to a minimum. Deep clean bites practically eliminate hand shoveling. Standard types (rope-reeve, power-wheel, link-type) in stock for immediate delivery. Write for complete information.

INDUSTRIAL BROWNHOIST

BAY CITY, MICH. • DISTRICT OFFICES: NEW YORK, PHILADELPHIA, PITTSBURGH, CLEVELAND, CHICAGO



New "Wood" Locker Racks Accommodate 12 in floor space of 5 ordinary lockers

The new hardboard and plywood Peterson Industrial Lockers come in both single and double (back-to-back) units that accommodate either *12* or *24* persons in every 5 running feet. Double locker room capacity and save valuable floor space for productive use. Provide each employee with a spaced coat hanger, an individualized ventilated hat shelf and a 12 in. x 12 in. x 12 in. lock box for lunch, micrometers, drawing instruments or personal effects. Keep wraps "in press" dry and sanitary—exposed to air and light. No crumpled hats or soggy lunches in stormy weather. Prompt delivery.

Write for circular.

VOGEL-PETERSON CO.

"The Checkroom People"

1841 N. Wolcott Ave. Chicago, U. S. A.

FATAL FALLS

minimized by remarkable new anti-skid and fire-preventive floor treatment. Speedi-Dri now used in hundreds of war plants to help prevent falls by skilled men. What would one accident to a key worker or one fire among your machines cost today! Speedi-Dri is quick, inexpensive, safe. Write for literature or demonstration on

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SPEEDI-DRI*

OIL AND GREASE ABSORBENT

East:

REFINERS LUBRICATING COMPANY, NEW YORK, N. Y.

S & W: WAVERLY PETROLEUM PRODUCTS COMPANY PHILADELPHIA, PA.

(*Continued from page 212*)

NATIONAL LABOR RELATIONS BOARD

Representation of Supervisory Personnel

Members of supervisory staff personnel may constitute their own bargaining unit, but they may not be included in a single bargaining unit, even though the union concerned may desire such a unit. (Boeing Aircraft Company, Union Collieries Coal Company, Godchaux Sugars, Inc.)

NLRB Voids Election

NLRB voided an election where the union was found to have electioneered, despite the union's claim that no actual interference with results was shown. Strict enforcement is essential, the Board concluded, if the objective of the Act is to be achieved. (Kilgore Manufacturing Company.)

Discharge Held Discriminatory

An employer's refusal to allow an employee to withdraw his resignation offered in expectation of imminent military service was ruled to be discriminatory where the refusal was prompted by the employee's union activities. (American Broach & Machine Company.)

Held an Unfair Labor Practice

Extra compensation as an inducement to key employees to cooperate in "quieting" unrest when the union was seeking to organize.

The fact that the employer informed his employees that they could form any organization they wished does not render the offer of extra pay less illegal. (NLRB vs. Heckay Chair Manufacturing Company.)

Picketing Enjoined

Even though a company is subject to the Wagner Act, the California Superior Court ruled that employees could be enjoined from picketing during the pendency of a representation proceeding before the National Labor Relations Board. (Park & Tilford Import Corporation vs. Brotherhood of Teamsters.)

Held Unlawful Interference

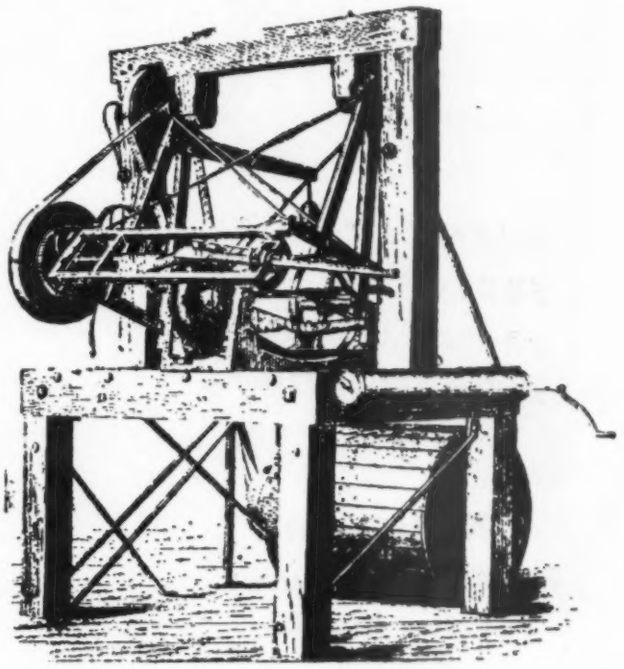
Removal of union signs from company property while leaving untouched other signs unrelated to the company's interests. (Gallup American Coal Company.)

** NLRB Orders Compliance Through Posting*

NLRB ordered management to post a notice directing employees to disregard any of management's words or

A Curious Machine

has lately been advertised — that will churn, scrape Potatoes, rock the cradle — and Darn Stockings —



THIS bit of early-American humor, which appeared in a New England newspaper more than a century ago, may well have been inspired by the "curious machine" shown here. It marks the beginning of a public awareness of the mechanical wonders ahead . . . Back in the days when "Industry" was spelled with an f, it was the birth notice of the Machine Age in America.

Picture the times when that notice appeared: Witchcraft was still a subject for serious dispute, and sane men believed that insanity was caused by Devils. Cocked hats and big-buckled shoes were still to be seen, and sober men declared the steam engine a passing idea, over their tankards of flip in the taverns. . . . The hammer and anvil were the symbol of the times, and every part of every musket or cannon or clock was made individually, by hand.

That was the setting. And in the midst of it, some of the greatest inventive geniuses the world has ever known were quietly changing the shape of things and of thought with the "curious machines" they were inventing. Such curious machines as the one shown here. Machine *tools*, with which each part could be made in quantity, and precisely alike. . . . Tools that were to make machines that would churn, scrape potatoes, rock the cradles of industry, and even darn stockings!

★ ★ ★ ★

BUT they were doing more of importance than inventing curious machines. Those men of mechanical genius were founding a handful of machine tool companies that have literally made possible all the rest of industry.

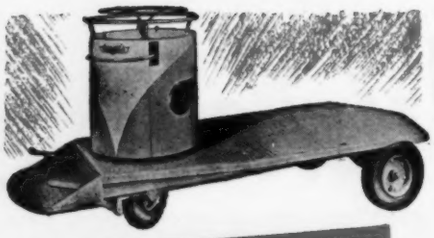
One of those companies — Jones & Lamson — is here today, a direct descendant of the first great machine tool builders in America. With a heritage of skills, knowledge and equipment that has constantly grown, from the very birth of our industrial age, Jones & Lamson engineers and service men are particularly qualified to serve any phase of industry today and during the difficult period of post-war readjustment ahead.

Jones & Lamson service is at *your* service now!

JONES & LAMSON
MACHINE COMPANY
SPRINGFIELD, VERMONT, U. S. A.

Manufacturers of Ram & Saddle Type Universal Turret Lathes . . . Fay Automatic Lathes . . . Automatic Thread Grinding Machines . . . Comparators . . . Automatic Opening Threading Dies and Chasers.

Profit Producing Machine Tools



SALSBURY
turret trucks
W.P.B. Approved
RELEASE MEN AND EQUIPMENT FOR URGENT JOBS AND SPEED PRODUCTION

✓ Fully Automatic
✓ Easiest to Maneuver
✓ Shortest Turning Radius
✓ Low First Cost
✓ Low Operating Cost

ONE MAN with a Salsbury Turret Truck can do the work of many men pulling and tugging at hand trucks. Much needed manpower and equipment are released for other jobs, labor costs are held to a minimum, idle machine time is reduced, production is increased.

For lifting, hauling or towing materials within your plant, there is a Salsbury Turret Truck to do the job easier, faster and more economically.

Salsbury Turret Trucks are made in three W. P. B. approved models—Lift, Platform, and Tractor. Write today for bulletin describing these 3 versatile, low-cost power trucks.

Distributed Nationally By
NUTTING TRUCK AND CASTER COMPANY
Faribault, Minnesota
Under license of Salsbury Corporation, Los Angeles

SALSBURY
turret trucks

acts which were hostile to the union and stating that no employees would be subjected to disadvantages for affiliating with the union. Such conduct, ruled the Board, would purge the employer of contempt. (Empire Ordnance Company.)

Enforcement Through Injunction

NLRB succeeded in enjoining a power company from making an agreement with an inside union which the Board had ordered disestablished. (NLRB vs. Virginia Electric & Power Company.)

We Hire Handicapped Men and Women

(*Continued from page* 117)

operation which he did perfectly from the first, he now runs a sand-polishing machine, drills holes in fiber, ties heel cords (an intricate procedure), and polishes fiber and metal.

Of course not all our successful workers come to us at as early an age as did Wenger. Under the requirements of our state's program, no worker is eligible for rehabilitation service who is over 50 years old (or under 16). But Arthur Rickoff was 49 when he came to our firm, with both lower limbs gone. Starting work as a shipping clerk, a job which required long hours of standing and some lifting, he has now been with us more than 20 years and, despite the fact that he is disabled and is now 69 years, he is rated as one of our most indispensable men in the fitting department.

Lest anyone get a wrong slant on our firm, it should be stated flatly that we do not in any sense run a curative institution—that is, a halfway station between convalescence and ability to take on a man-sized job. We have never devised or found it expedient to devise any sort of special machine attachment to enable a crippled worker to do his work. Nor is any attention directed toward giving workers tasks which will, say, help restore strength in an affected limb.

Men with a prosthesis bear up under the strain of standing long hours as well as do physically normal individuals; work absences in our plant, caused either directly or indirectly by physical disabilities, are practically unknown; our labor turnover is at zero; and the average length of time workers have been with us is more than 15 years.

At present, because we are working 58 hours a week—time and one half for each hour worked in excess of 40 hours—we have two rest periods a day,

in all hands

Laminum shims place quick *precision* in the hands of every assembly and maintenance man. (.003 or .002 in. brass laminations bonded together and easily peeled.) Cut to your specifications.

Stock shim materials obtainable from your mill supply distributors. (Write us for sample and illustrated application chart.)

Laminated Shim Company
Incorporated
54 Union Street — Glenbrook, Conn.

it's
LAMINUM
THE SOLID SHIM THAT peels FOR ADJUSTMENT

Interesting

The New

Monitor

THERMALOAD V

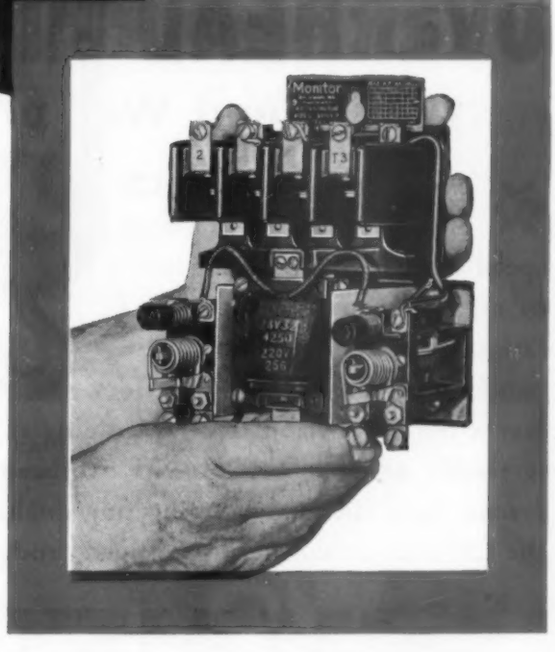
SOLENOID STARTER

Here is a solenoid starter that gives you the kind of protection you need. Because into this sturdy, compact unit, is built a feature that has proved its worth over years of service in larger Monitor installations—a feature that Monitor originated—the Monitor Compensated Thermal Overload Relay. Extremes in ambient temperature will not affect its performance! The trip *always* occurs in the same time at a given percent of overload. Full overload protection for your motor is assured regardless of installation characteristics.

Other features include: Vertical, Straight-line Design . . . Resilient, Shock-proof Mounting for quiet operation . . . Double-Break, Silver Contacts . . . Easily-Interchangeable Coils. And—Monitor quality construction throughout — your assurance of longer, more satisfactory performance.

For original equipment and for replacement—specify the starter that meets today's needs—the Monitor Thermaload V.

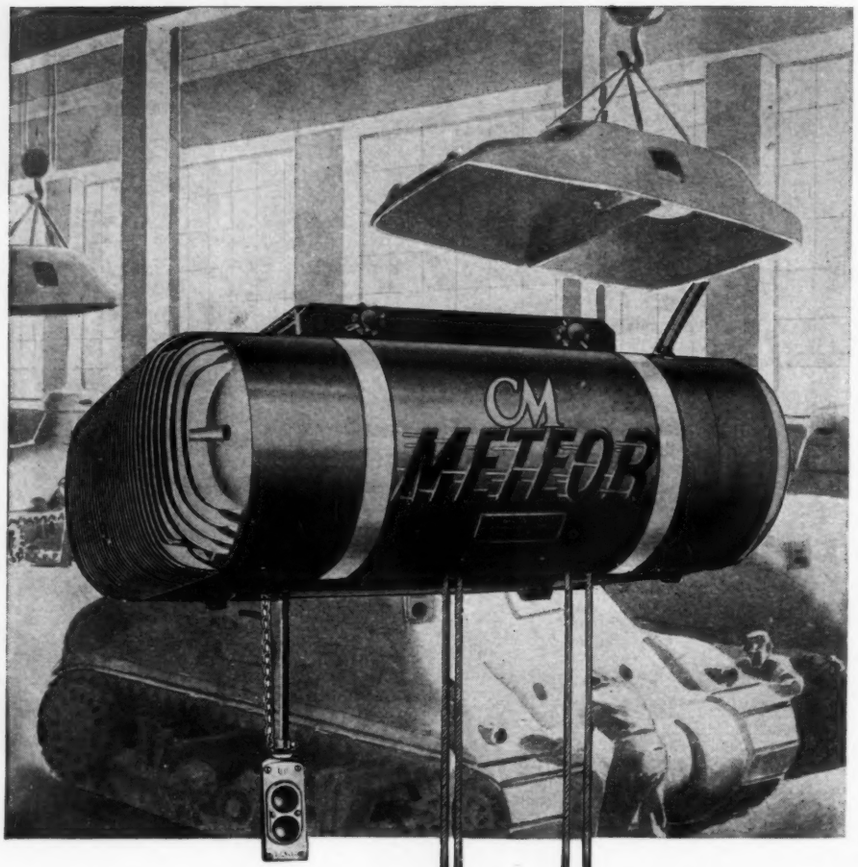
For further details and delivery dates, write us today.



5¾ ins. x 5¼ ins. x 4⅛ ins.

These small over-all dimensions indicate better, more compact design. They permit installation in smaller spaces. Available in five sizes—1.5 to 7.5 H.P. 110 to 550 V. (A.C.) Fully approved by Underwriters.

The Monitor Controller Company



OVERHEAD HIGHWAYS

that speed War production

Throughout the nation CM Meteor heavy duty electric hoists ride the over head highways... speed War production in the lifting and transporting of materials and assemblies. CM Meteors lessen worker fatigue and reduce time-wasting interruptions. One hand push button control provides accurate spotting and leaves the other hand free for guiding the load. The CM Meteor is readily adaptable to present overhead monorail systems and cranes. Fully illustrated engineering catalog No. 142 explains why the CM Meteor will help you speed production.

CM METEOR

★ ★ ★

INVEST REGULARLY IN VICTORY—BUY WAR BONDS AND STAMPS

★ ★ ★

CHISHOLM-MOORE HOIST CORPORATION

(Division of Columbus-McKinnon Chain Corp.)

120 FREMONT AVENUE, TONAWANDA, NEW YORK

BRANCH OFFICES: NEW YORK • CHICAGO • CLEVELAND

each 15 minutes, at 10 a.m. and at 3 p.m., during which refreshments are served.

Moreover, our plant is safe. We have not had a major accident in many years; in fact, for the past three consecutive years we have been awarded plaques in recognition of safety by one of the largest liability insurance companies in the Northwest, and this year we look forward to receiving the fourth.

Inspectors in Ten Weeks

(*Continued from page 119*)

Once the student has received the proper background in elementary trigonometry, most of the time is spent in the solution of practical shop problems such as arise in inspection work. The classes in mathematics are divided into three sections of from 20 to 30 men, and the classes are reshuffled after each quiz so that the slower students may receive more intensive drill in the fundamentals while the faster men receive a more enriched course. Because of the diverse backgrounds of the individual students, a placement quiz during the first week has been found to be of great assistance in forming the three sections.

Blueprints

Three lectures and nine hours of laboratory a week are spent in *drafting and blueprint analysis*. The purpose of this course is not to train draftsmen but to teach the men how to read and analyze blueprints, particularly the types of blueprints used in the aircraft industry. During the first half of the laboratory course, the men are taught the elementary basic concepts of mechanical drawing. They are given simple objects from which to make orthographic projections and isometric sketches. The drawing of cross-sections and of simple developments and intersections is included. The use of all types of welding symbols and standard representations of different materials by means of cross-hatching is discussed.

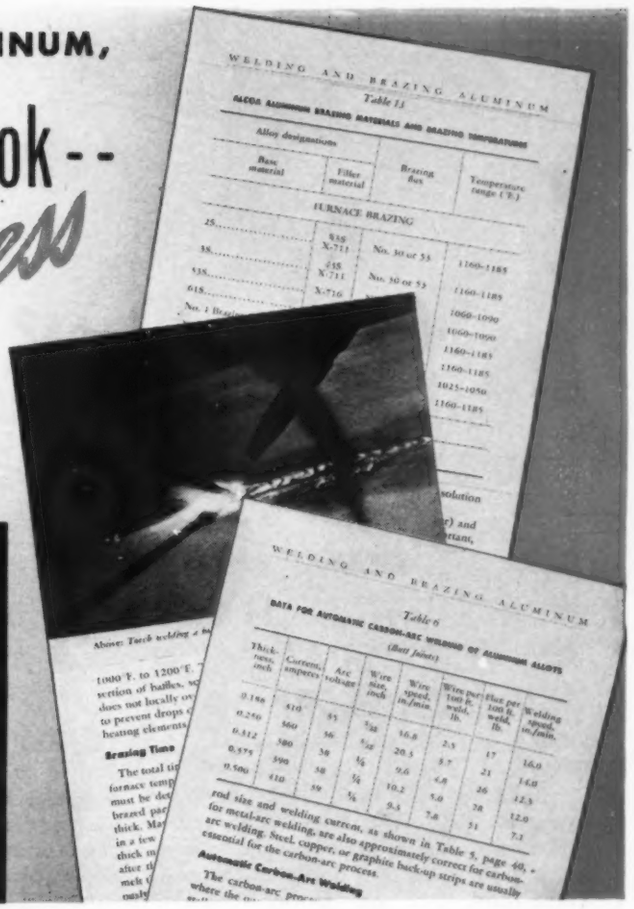
Throughout the course the work is correlated with the material in the *shop mathematics* course, and to this end the students are asked to calculate the lengths of diagonals, the volumes and weights of irregular shapes, and the sizes of sheets required to cut out given three-dimensional patterns.

In the second half of the laboratory course, actual blueprints used in the aircraft industry are studied. The subjects of the prints run from very small parts to subassemblies and complete

IF YOU'RE WORKING WITH ALUMINUM,

you should have this book--

just off the press



WELDING AND BRAZING ALCOA ALUMINUM

Here's a book of data designed to meet the needs of the practical man—the welder—who is working with Aluminum Alloys. It describes in detail the practices now widely employed for joining Aluminum parts by gas welding, arc and resistance welding, and by brazing.

This book is planned to assist the war effort by making every welder more proficient at his job. Typical subjects covered are: Welded joint design—preparation of parts—types of welding equipment—electrodes and fluxes—tip selection and flame adjustment—inspection and finishing—strengths of welds.

Joining Aluminum Alloy parts by welding and brazing is readily mastered with knowledge like this at your command, plus a little practice. You may have this book free. Use the coupon to send for your copy today.

ALCOA

ALUMINUM

ALUMINUM COMPANY OF AMERICA,
2126 Gulf Bldg., Pittsburgh, Pa.
Please send me this new book.

Name_____

Company_____

Street_____

City_____

GET IN THE SCRAP
One ton of your idle scrap makes two tons of fighting steel. Search your plant again and again—every pound of scrap is important.

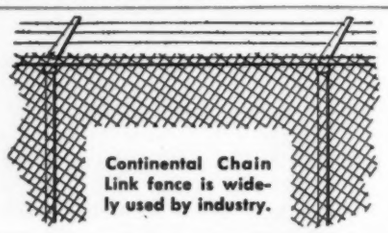
WHAT CONTINENTAL STEEL IS DOING BETTER FOR WAR TODAY . . . IT WILL DO BETTER FOR YOU TOMORROW

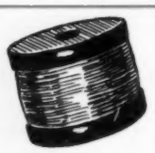
The production of steel and steel products to meet the varied demands of war is building a reserve of specialized metallurgical information and production experience at Continental. This fund of knowledge will be at your call when the war ends.

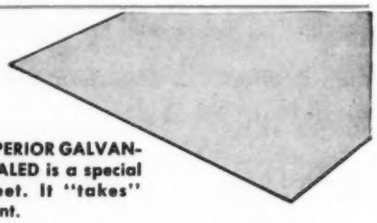
Continental will be better equipped than ever to meet your needs in steel sheets, manufacturer's wire and steel products, and to work with you on your plans for new products and new production. We invite inquiries about present and future needs.

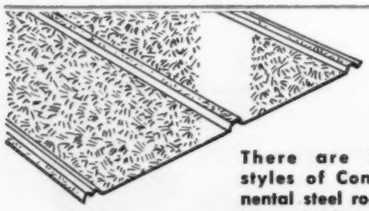
CONTINENTAL STEEL CORPORATION, KOKOMO, INDIANA
(The Superior Sheet Steel Company, Canton, Ohio—a subsidiary)

Continental's galvanized sheets are well-known for workability and uniformity.


Continental Chain Link fence is widely used by industry.


Fine wire is produced as small as 34 gauge by Continental.


SUPERIOR GALVANNEALED is a special sheet. It "takes" paint.


There are 14 styles of Continental steel roofing and siding.

Continental manufacturer's wire is made in many sizes, shapes and finishes.

CONTINENTAL STEEL CORPORATION

PRODUCERS OF—SHEETS: Black, Galvanized, Copperior, Hot and Cold Rolled, Special Coated, Long Terne, etc. WIRE: Bright Basic, Annealed, KONIK, Coppered, Tinned, Special Manufacturer's, etc.

assemblies. The prints are studied for the relationships between the views and for the significance of the various symbols, shop notes, titles, etc. This procedure, of course, necessitates a complete understanding on the part of the student of Army and Navy standards and the standards of the individual industry. In general, the prints are fully explained by the instructor, and the student is then required to hand in written answers to ten or fifteen questions based on each drawing in order to demonstrate his understanding of the material.

The lectures in *blueprint analysis* parallel the laboratory work. In the first portion, the drawing principles are described and demonstrated. In the second part, the men are made familiar with airplane nomenclature, types of metals used in aircraft construction, fabricating processes, and use of the "standards" books. The point that is stressed above all in the course is the understanding of the complete relationship of any one drawing to the airplane as a whole.

Engineering Materials

The fifth subject is *engineering materials*, which occupies three lectures a week. The material covered includes a description of the refining of iron ore and the manufacture of steel, the alloy theory in its various cases, a study of the iron-iron carbide equilibrium diagram, and an analysis of the heat-treating of various steels. The student is introduced also to non-ferrous metals and alloys, theories of corrosion, surface finishes, and an elementary discussion of plastics. The main purpose of this subject is to furnish the student with background material so that he may better understand many of the problems that arise in inspection work.

The success of the course can perhaps best be gaged from the fact that it is now being given for the eighth consecutive time. The subject matter has been outlined with the advice of the executives of the aircraft industry, and at each repetition of the course has been modified and revised to meet the changing needs of the industry. Some 480 men and women have completed the course and very nearly all of them have taken jobs immediately as junior inspectors at increasing rates of pay. Twenty-three industries in the Baltimore Metropolitan area, including many others besides the aircraft industry, are employing graduates of this course. The important fact remains, that in accelerating the training period, courses such as this are opening up sources of supply for trained personnel that would otherwise be unavailable to industry.

What Pump Can Handle *This?*

It's "ceramic slip" for spark plug insulators, one of the hardest-to-pump, most abrasive materials known. Read how the Champion Spark Plug Company solved this tough problem by using the *R & M Moyno Pump!*

"We are pleased to report that our R & M Moyno Pumps are giving satisfactory service. From our experience we have concluded that they have definite advantages over other pumps we have tried.

"Our spark plug insulator body is highly abrasive, and pumping such a slip is a very difficult undertaking. Repairs to our Moyno units have been held to a minimum, and due to the easy accessibility of all parts, only short shut-down periods are necessary for replacing worn parts."

Norman C. Shimman, Assistant Superintendent at Champion's Ceramic Division, with one of their Moyno units. His left hand rests on the rotor and stator assembly while he explains how the Moyno elevates abrasive slip *40 feet* to the second floor—eliminates harmful bubbles, increases production and reduces "pumping trouble" delays and maintenance to an all-time low.

Do you have a *tough* pumping problem? Then now's the time to investigate the R & M Moyno! Whether your problem is handling a high-pressure gun-boring coolant, a corrosive chemical, an abrasive material like Champion Spark Plug's "insulator slip," or almost *anything* that will flow through a pipe, the R & M Moyno Pump can probably solve it just as it has whipped countless "impossible" pumping problems.

The Moyno is a *revolutionary* pump. It eliminates piston and valve wear because it has *no* pistons or valves. Cavitation and pulsation are also eliminated because the Moyno always provides constant, uniform flow. Even maintenance time and labor are drastically reduced, for the Moyno is so accessible that it can be completely dismantled and reassembled in 30 minutes or less. And finally, the Moyno is so compact and simple in design that it is easily installed in the plant or mounted on the machine it serves.

Many designers and product engineers are now specifying the R & M Moyno Pump as original equipment on their machines, while production engineers in many industries are adapting it as a proved method of increasing output and improving quality. Write for complete information today!

ONLY 1 MOVING PART!

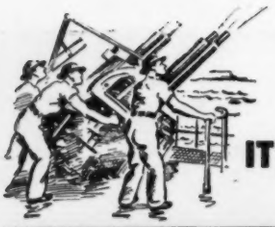
Here's the patented principle of the R & M Moyno Pump's amazing performance. A single-threaded helical rotor revolves within a double-threaded helical stator, providing pumping action like that of a piston moving through a cylinder of infinite length.

ROBBINS & MYERS • Inc.

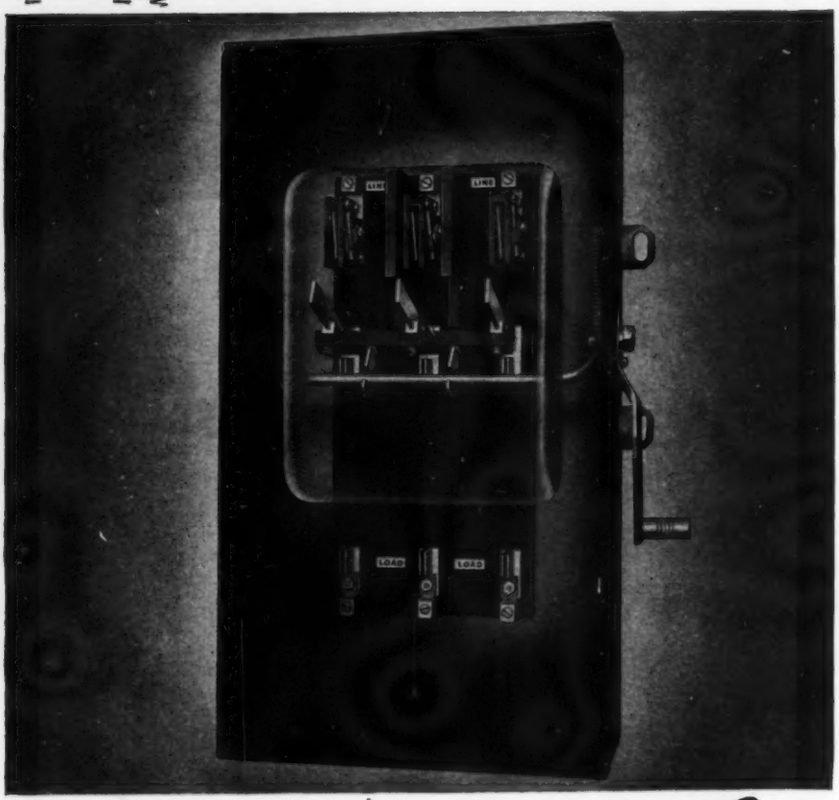
MOYNO PUMP DIVISION SPRINGFIELD, OHIO

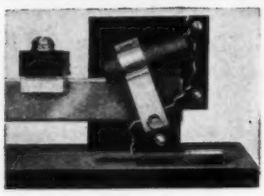
In Canada: Robbins & Myers Co. of Canada, Ltd., Brantford, Ont.

HOISTS • CRANES • MOTORS • MACHINE DRIVES • FANS • FOUNDED 1878

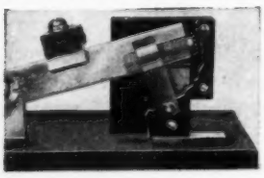


IT'S YOUR PIGEON, TOO, MISTER

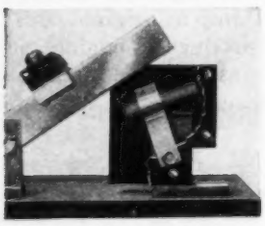




View of Rolarc snuffer showing blade in full engagement with live contacts before passing thru rollers towards OFF position.



View of Rolarc snuffer showing blade at point of final disengagement from live contact jaws.



View of Rolarc snuffer showing blade after disengagement from live contact and rollers. Rollers snapped together again obstructing path of possible arc.

THE FEDERAL *Rolarc*

.. DESIGNED TO DO THE JOB

Winning the war is our problem—our job as much as it is the job of the men manning the guns. It's our "Pigeon"—and yours.

To get the job done—to help do it faster and better—Federal developed the 575 Volt Rolarc Safety Switch. Here's a dependable, hard working switch, 100 to and including 600 ampere capacity, built to carry the load.

Engineered on an entirely new principle of arc control, the Rolarc reduces the possibility of arcing to an *absolute minimum.* It lengthens switch life and conserves war-vital copper . . . it increases the safety factor and saves priceless time and power by eliminating dangerous arcing . . . it increases production by eliminating delays caused by switch failure.

If production is "your pigeon" let the Federal Rolarc Safety Switch help get the job done. *Get all the facts—write for bulletin 42-12.*

Until stocks on hand are exhausted we must reserve the right to ship our regular 575 Volt Safety Switch unless Rolarc is specified on the order.

FEDERAL ELECTRIC PRODUCTS CO.

58 PARIS STREET NEWARK, N. J.

PANELBOARDS • SWITCHBOARDS • SAFETY SWITCHES • CIRCUIT BREAKERS

Management Shorts

(*Continued from page 120*)

Made by N. Mathis, Paraffine Companies, Inc., Emeryville, Calif.

The instruction and training of new employees has been the foreman's responsibility in the past, but with so many new employees it is believed that the foreman is overburdened with training. Senior employees can greatly assist him in this part of his work. The result will be in having better trained workers sooner, thus improving and actually lessening the load on other employees.

It is understood that the foreman must continue to issue safety instructions, and that he remains responsible for the new employee's training, but much of the physical operation can be well and readily taught by the senior employee.

Suggestion No. 3

New payroll method saves man- and machine-hours.

Made by Vincent Sullivan, American Type Founders, Inc., Elizabeth, N. J.

A plan to revise payroll procedure so that men can be paid off at their machines without losing any productive time, either on the part of the men or on the part of the machines. It has been estimated that this will save approximately 33 man-hours and 33 machine-hours per week in a division that employs approximately two hundred men on two shifts.

Suggestion No. 4

Counselor for girl employees solves a personnel problem.

Made by Doris Mawson, Administration Division Service Section, Philadelphia Signal Corps Procurement District, U. S. Army.

As a result of this suggestion, a counselor has been employed to whom the girls, of whom a large number are away from home, can come for advice and help. Experience in England has shown these women counselors to be helpful where large numbers of women are employed. It is preferable that she be middle-aged and have had much experience in handling women's problems. It is not necessary for her to be a psychiatrist or to have had training along this line.

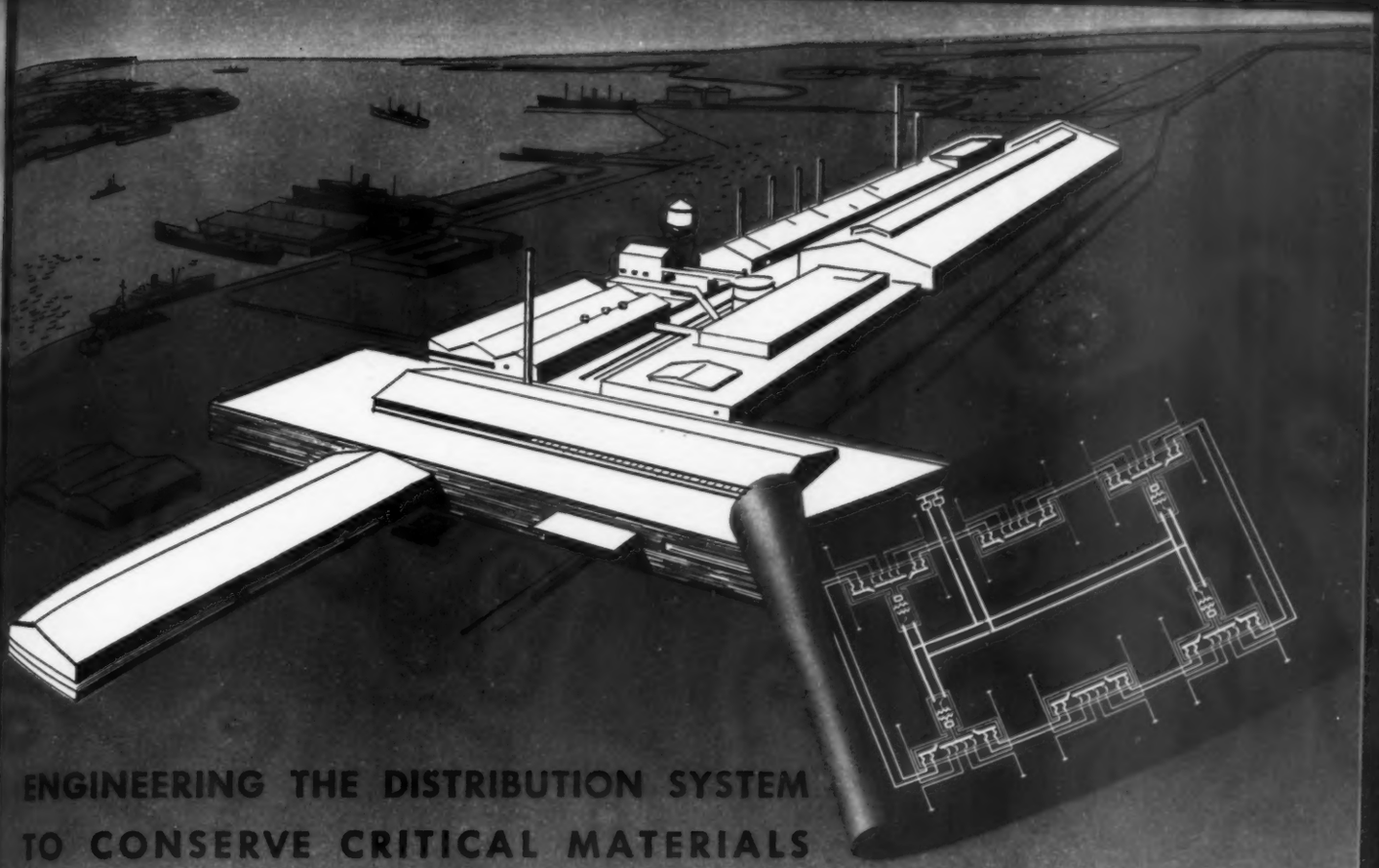
It has worked better when the counselor does not have any authority and the employees know it. She should, however, have the ear of responsible management so that troubles may be corrected before they become too serious. She also should be equipped with many facts, such as budgeting, rationing rules, locations of nurseries, shopping districts, housing etc.

Suggestion No. 5

Scotch tape helps cure the "mixed work" headache.

Made by John Gamble, Allen Manufacturing Company, Hartford, Conn.

Tags used to identify totepans of work —screws, for example—soon get dirty



ENGINEERING THE DISTRIBUTION SYSTEM
TO CONSERVE CRITICAL MATERIALS

Saved 11 tons of copper

HOW WESTINGHOUSE CAN HELP YOU SAVE TIME • CRITICAL MATERIALS

• **Selecting the Right System**—Wide application experience in all types of industries enables Westinghouse engineers to recommend the distribution system best fitted to your plant.

• **Air-Cooled Transformers**—permit location close to load centers with maximum safety, eliminate expensive vaults.

• **Hipersil**—an exclusive Westinghouse development with ⅓ more flux-carrying capacity than ordinary silicon steel. Reduces transformer size and weight.

• **Loading by Copper Temperature**—permits use of *all* the transformer capacity, with complete protection against burnouts.

• **Improving Power Factor**—through use of capacitors, can often save installation of new feeder lines. Westinghouse engineers are in a position to make such practical recommendations.

A vital war plant faced the problem of providing reliable power supply. The distribution system originally planned required 70,600 pounds of copper.

By recommending a plant network system custom-fitted to the job, Westinghouse engineers were able to provide greater flexibility with increased sabotage protection—using *only* 48,400 pounds of copper. Result: 22,200 pounds of critical material saved—more than 11 tons.

Westinghouse plans and builds *all* types of distribution systems. Thus broad engineering experience is brought to bear on your particular problem. The final recommendation is based on nature, density and location of load—and critical material saved. All systems recommended are designed to use standard distribution equipment. No time is lost in building special apparatus.

For prompt action, call our local office. Or send for the helpful booklet below. Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

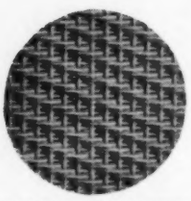
J-94534

UP-TO-DATE FACTS ABOUT DISTRIBUTION SYSTEMS

Keep up-to-date on latest plant distribution systems. Send for this 24-page Book, B-3152, which briefly describes different plant distribution systems, and points out the advantages of each.

Westinghouse **PLANT DISTRIBUTION SYSTEMS**

PLANTS IN 25 CITIES... OFFICES EVERYWHERE



DUTCH TWILLED WEAVE

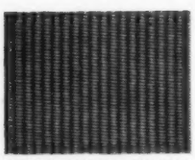
. . . and wherever wire screen has a war-job to do!

OUR TANKS are out there today fighting plenty of sand as well as Fascists . . . and drinking gas and oil that must be purged of these engine-destroying impurities.

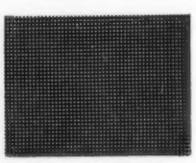
It's a job for Roebling Wire Screens (in the form of wire filter cloth) all the way from the refinery to the tanks' own liquid lines. And it's just one of hundreds of ways that woven wire is fighting and fighting hard for Victory.

How does your product fit into this picture? Can its performance be improved by carrying a filter cloth into battle . . . or would its raw materials be conserved by better grading and sifting and washing?

Whatever the problem, there's a Roebling Wire Screen for every job in the nation's war product and production programs. Screens from 1" rod stock to .001" wire . . . steel, brass, copper, phosphor bronze, stainless steel, aluminum, monel or whatever metal you require. Roebling makes them all promptly available to manufacturers of essential products.



DUTCH PLAIN WEAVE



PLAIN WEAVE

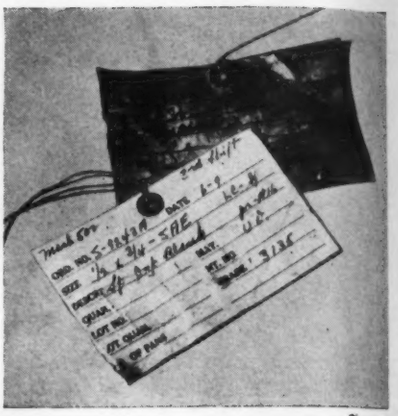
JERSEY STRANDED FILTER CLOTH

JOHN A. ROEBLING'S SONS COMPANY
TRENTON, NEW JERSEY • *Branches and Warehouses in Principal Cities*

ROEBLING

WOVEN WIRE SCREENS

JR ROEBLING



and the writing on them becomes illegible. The result is that screws get mixed and much time is lost in separating them. This difficulty has been overcome by sticking a piece of scotch tape over the writing, which shows order number, size, description, quantity, etc. This procedure saves tags, keeps the writing legible and hence contributes greatly to the solution of the mixed work problem.

Suggestion No. 6

Photographs help new men make complicated set-ups.

Made by Harvard Smith, Frost Company, Kenosha, Wis.

This company was going to have its draftsman draw and blueprint many complicated tool set-ups involving stop blocks, bending blocks, etc. Photographs, with all dimensions lettered on them, are now used instead. They provide a clear picture of every tool set-up, save at least 50 percent of set-up time, make it unnecessary to have an experienced set-up man on the job. Any of the newer men can take a production order, the necessary blueprints, the set-up picture, and proceed to set up the tools needed.

The average length of time to take each picture is about 15 minutes, compared to the one and one-half hours that is the average length of time required to draw a set-up. Pictures will be placed in celluloid holders, and will have printed on the back all information pertaining to that particular job.

Suggestion No. 7

Pressed wood jigs release vital metals, increase output of riveting machines.

Made by Ben E. Stewart, Curtiss-Wright Corporation.

On riveting operations—stringers to aluminum sheets, for example—metal jigs were used in connection with punching and riveting machines. These jigs are index plates which hold the parts to be riveted, and are guided to the point of operation over a locating stud by a series of countersunk holes spaced to duplicate the rivet pattern desired.

The method is not new. It is extensively used because it is twice as fast as the ordinary method of pre-drilling the sheets, burring the holes, assembling the parts, inserting the rivets by hand, and bucking the rivets.

By substituting pressed wood for metal, strategic materials are released for other

SABOTAGE ... *from the air*

Sharp . . . jagged . . . destructive! Not bombs. Merely little specks of dust . . . but far from harmless, as high-powered microscopes would show.

It is easy to imagine what damage these hard, jagged particles can do to precision finished bearing surfaces in equipment ranging from delicate instruments to heavy machines. When a highly finished part must be scrapped because of dust-damage, much more is lost than just a piece of metal. Many hours of expensive, painstaking labor are completely wasted.

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Air Conditioning and Commercial Refrigeration Department, Division 431, General Electric Co., Bloomfield, N. J.

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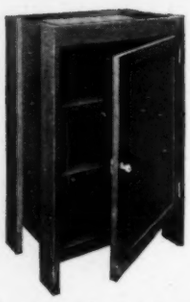

Ample and adequate storage for tools, instruments, gauges, etc. Like the steel unit, top can be used as a work bench. Rugged, engineered construction. Keep 'em right on the job and prolong tool life.

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Ask for detailed information and literature on the complete Penco Line of Storage Equipment in Wood or Steel.

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war uses. And, because the new jigs weigh only about one-fifth as much as the metal ones, the machine method can now be applied to larger sheets than could formerly be handled. The reduction in weight is doubly important because it enables women to handle jobs for which they would otherwise not be suited.

Suggestion No. 8

Sketch saves time in installation of gas tank cover.

Made by Ray Steele, Northrop Aircraft, Inc.

A labeled sketch of a gas tank cover, showing the proper length and size of screws, bolts, etc., and their location, enables four new men following this diagram to install a tank cover with no trouble. Eliminates repeated removing of cover to replace too-long screws which prevent its being flush. Also eliminates continuous screwing which pushes channel nuts out.

Suggestion No. 9

Employees have option of working through their earned vacations in order to relieve problem of replacements.

Made by R. Gacherieu, Paraffine Companies, Inc., Emeryville, California.

Purpose is to increase the available supply of labor and to discourage employees from seeking temporary work in other fields during their vacations. Employees working in unfamiliar jobs during vacation are more apt to be injured and thus lose additional time on regular job.

It is believed only a small percentage will forego vacations, but those who do are better off working in their regular job than on one with which they are unfamiliar. Only those employees who the Department Head feels do not require the rest shall be allowed to forego their earned vacations.

•

Portable Food Counter Serves Mill Workers

SOURCE—Carnegie-Illinois Steel Corp.

Employees at both the Gary and Irvin Works of this company, who cannot conveniently leave their work to patronize the mill restaurants, are now being served food and refreshments at their posts by means of stainless steel portable food counters recently placed in service at these mills. An outside concessionaire operates the service.

Looking very much like a section of a modern cafeteria counter, these units are equipped with rubber-tired wheels so that they may be rolled easily from place to place. They are designed not only to transport many of the items available in the mill restaurants, but also to display them in an attractive manner. Glass-inclosed shelves in the upper section hold sandwiches, doughnuts, cakes, candy, and tobaccos. Insulated compartments in the lower section provide space for milk, ice

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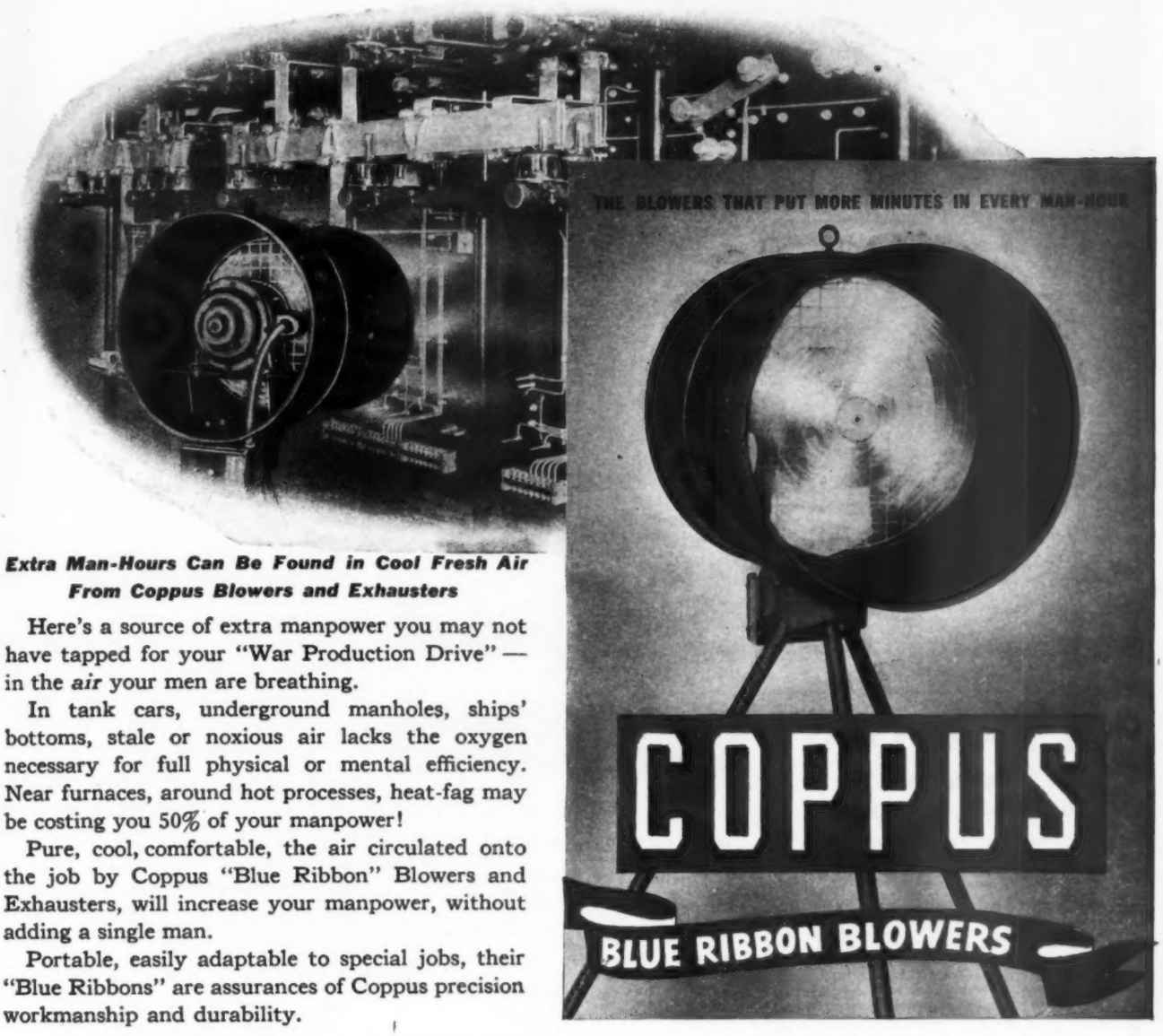

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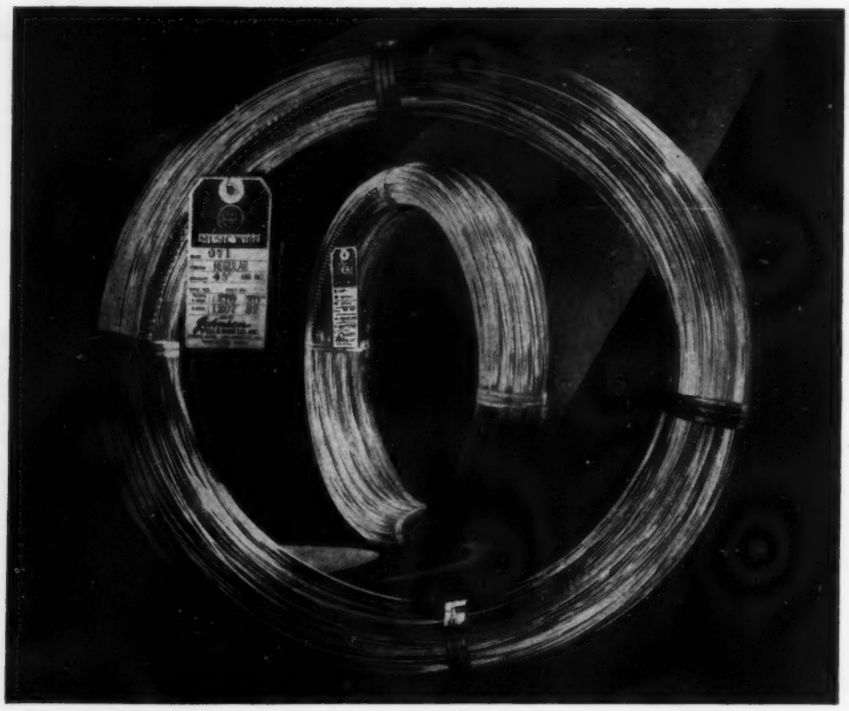

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Glass Jars Display Salvaged Parts

SOURCE — Vultee Aircraft, Inc., Inland Division

For approximately two years the Inland Division had been picking up floor sweepings and delivering them to the trash pile for burning. No attempt had been made to reclaim any parts from the sweepings until a material conservation department was set up for salvaging. The amount of parts reclaimed caused considerable surprise and the department decided that correction lay not in better and quicker methods of segregation, but in making employees conscious of the number and value of parts dropped on the floor through carelessness.

Now, under the plan conceived at the time, the sweepings of each department are kept in separate piles. The parts reclaimed from each are placed in glass jars labeled with the date and department from which they are reclaimed. These jars are then placed in each department until five jars have been accumulated. Then the oldest is taken back to the material-conservation department and a new one put in its place. Five jars are kept in view at all times. They enable the workmen to check constantly on the effectiveness of their efforts to reduce the amount of material dropped on the floor. At the end of two weeks records showed a 60-percent decrease in materials reclaimed from all departments.

•

Fire Control Towers Made by Welding

SOURCE—Hobart Brothers Co., Troy, Ohio

The illustration shows the simple design of the all-welded fire control towers used throughout the lumber yards of the P. H. Gladfeller Company, Spring Grove, Pa. If desired, the permanently mounted nozzle may be left off, in which event the tower would be used as an observation post and for fighting fires with a hose line.

All pipe and iron used in building these towers was taken from the scrap pile. A mounting ladder, not shown in the drawing, was made from light but sufficiently strong sections assembled by welding and then welded in place.

One of these inexpensive fire towers can be turned out by two welders in eight hours' time.

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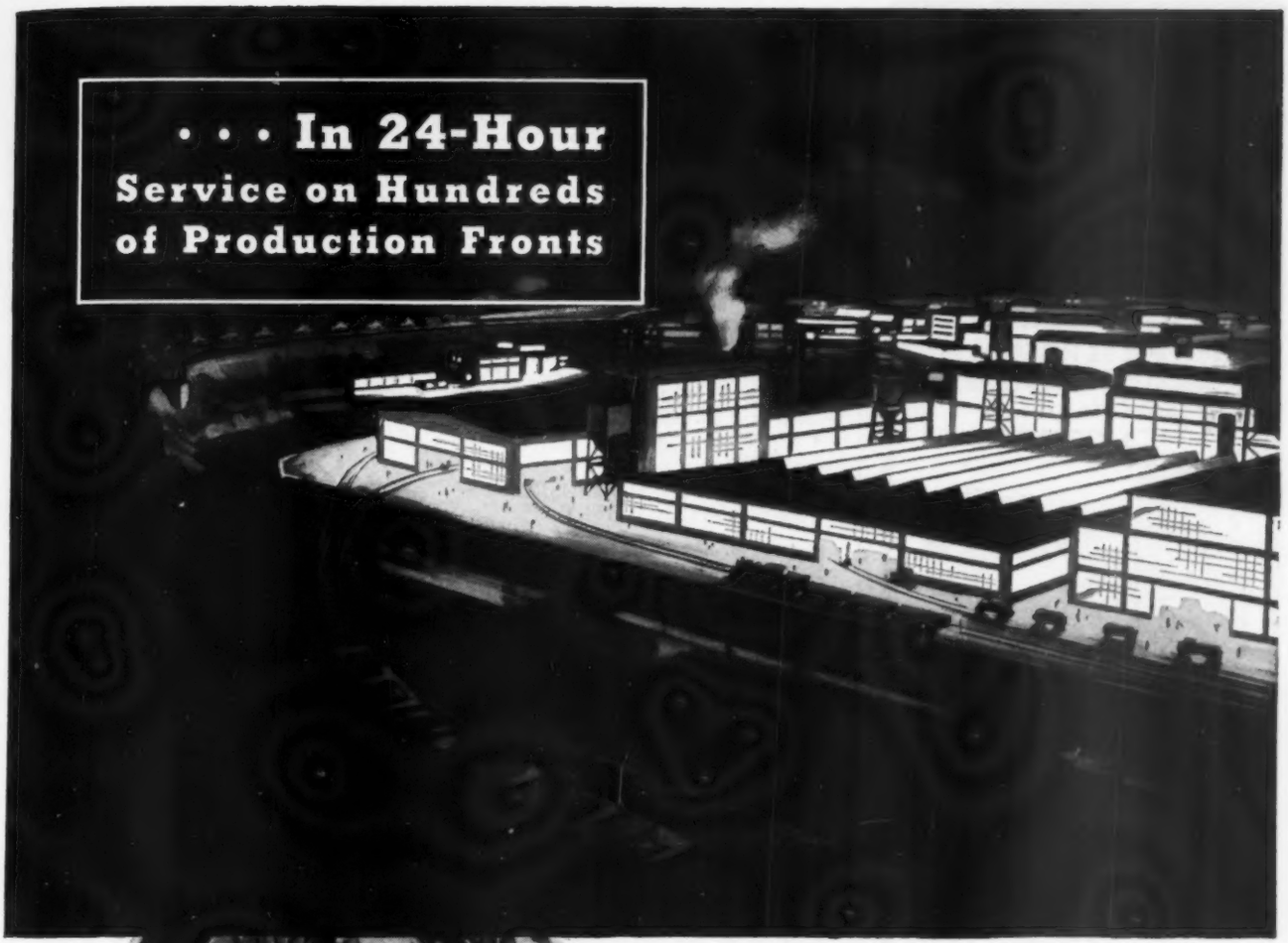

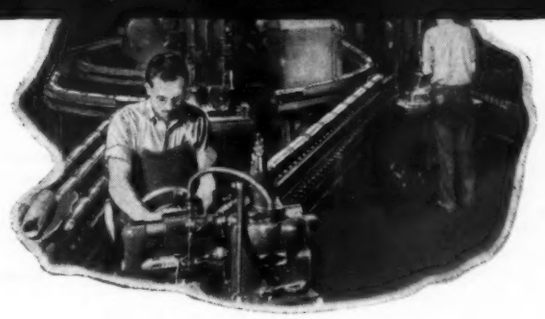

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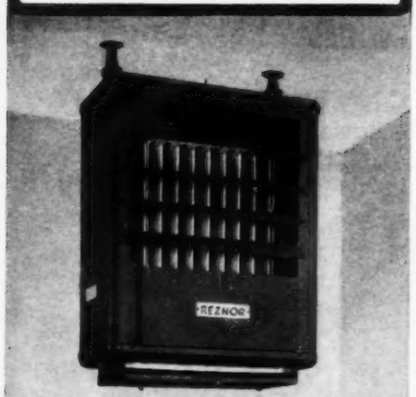

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Hyman Levy, M.A., D. Sc., F.R.S.E., Professor of Mathematics, Imperial College of Science and Technology, London. The Ronald Press Co., 15 E. 26th St., New York. 216 pages. Drawings, tables, equations, $1.50.

One of a group of books in which authorities cover each of the sciences underlying aeronautics. This book is intended to lay a solid foundation in the mathematics that all students of aeronautics must have. Miscellaneous exercises and logarithmic tables are included—and all the answers are given in the back of the book.

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Herbert Moore, Ph.D., Consultant, Tests and Attitude Studies, Business Research Corp., Chicago. McGraw-Hill Book Co., 330 W. 42nd St., New York. 526 pages. Drawings, tables, index. $4.

Second edition. Written to introduce the student to those aspects of personnel problems in business and industry to which psychology has given, or can give, a contribution. Does not attempt to cover management and economic problems. Chapter headings include: Psychology's Service to Business and Industry; Getting a Job; The Importance of Proper Selection; Hiring the Worker; Testing the Applicant; Special Ability Tests; Personality Tests; The Problem Employee; and many others.

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BOOKLETS

FOUR FREEDOMS—The United Nations Fight for the Rights of All Men, Everywhere. Office of War Information, Washington, D. C. 15 pages. Drawings. No charge.

AFTER THE WAR?—Maxwell S. Stewart. Public Affairs Pamphlet No. 73. Public Affairs Committee, Inc., 30 Rockefeller Plaza, New York. 32 pages. Drawings, bibliography. 10c.

WAGES AS COST AND AS MARKET—Edwin G. Nourse. The Brookings Institution, Washington, D. C. 43 pages. Tables. 25c.

DISCUSSION OF INDUSTRIAL ACCIDENTS AND DISEASES—Bulletin No. 53. 1941 Convention of the International Association of Industrial Accident Boards and Commissions, Winnipeg, Manitoba. United

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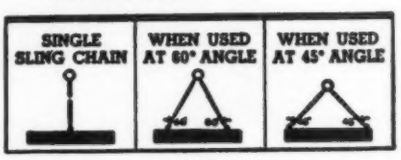

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The most important thing that many of them see there is prosperity!

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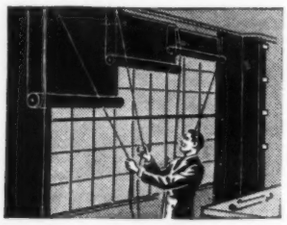

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TEN YEARS' PROGRESS IN MANAGEMENT—Presented at the Annual Meeting of the ASME. Management Division, American Society of Mechanical Engineers, 29 W. 39th St., New York. 49 pages. 30c.

THE WAR WORKERS' LUNCHBOX. Ora Blanche Burright, Secretary, The Labor Bureau, Nutritionist and Home Economist. The Labor Bureau, 152 W. 42nd St., New York. 22 pages, mimeographed. 10c.

•

ON THE CALENDAR

JANUARY

11–15, Society of Automotive Engineers, Detroit. War Engineering Production Meeting (Annual Meeting). John A. C. Warner, Secretary and General Manager, 29 West 39th St., New York.

25–29, American Institute of Electrical Engineers, Winter Convention, New York. H. H. Henline, Secretary, 33 West 39th St., New York.

26–28, American Society of Heating & Ventilating Engineers, 49th Annual Meeting, Cincinnati. A. V. Hutchinson, Secretary, 51 Madison Ave., New York.

FEBRUARY

10–12, American Management Association, Personnel Conference, Chicago. James O. Rice, Assistant Secretary, 330 West 42nd St., New York.

•

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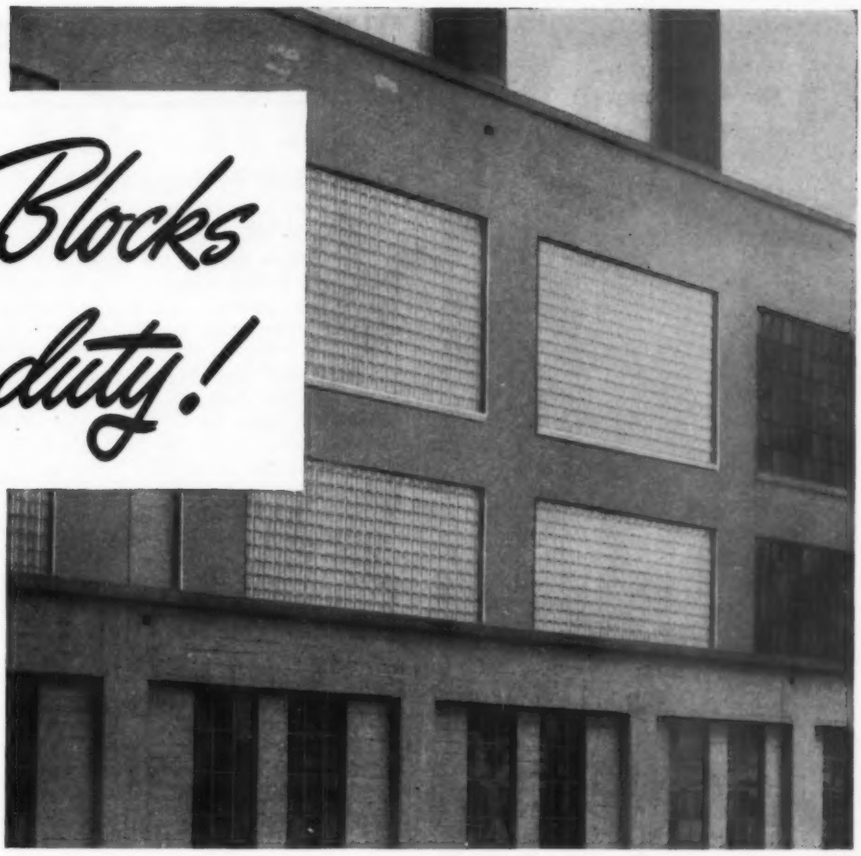
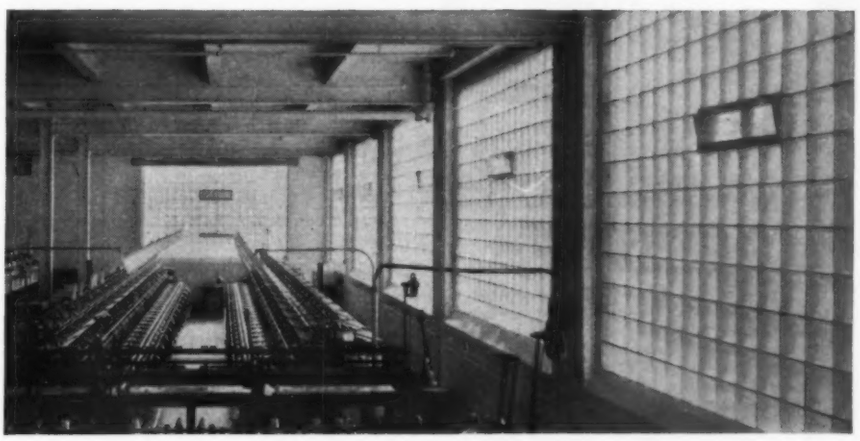


1. They replace worn-out sash without using critical materials.

When poor condition of window sash makes replacement necessary there's no need to wait. Do the job with PC Glass Blocks. They contain no critical materials — orders can be filled promptly and fully. Installation can be done quickly—by a regular mason. Take out the worn sash—scrap the metal. Install new chases if necessary. Then fill the openings with PC Glass Blocks. Once the job is done, you can forget about window sash troubles—for neither the glass blocks themselves nor the mortar joints will rot or corrode.

2. They improve plant operating efficiencies.

PC Glass Blocks transmit an abundance of daylight into the plant—diffuse it well for better seeing. And, because there is a sealed-in dead-air space in each block, good insulation is provided in light-transmitting areas. In computing heat losses through panels for design purposes, it is recommended that a "U" value of 0.49 be used for all block sizes and face patterns. Heat loss is sharply reduced in winter. Heat gain is reduced in summer. Temperature and humidity can more easily be controlled within close limits. The result is greater accuracy of precision tools, greater product uniformity and reduced spoilage.



Before you replace any window sash in your plant, get the facts about PC Glass Blocks. Send for our free book that shows how many branches of industry have used PC Glass Blocks successfully. Gives technical data on insulation, light transmission, surface condensation, crushing strength and many other important factors. Mail the coupon below.

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"PITTSBURGH" stands for Quality Glass

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Please send me your free, illustrated book that tells how PC Glass Blocks have been used successfully in many industrial plants.

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Plant feeding SPEEDS plant production. Workers feel better because they're better fed, in pleasanter surroundings. Output rises because lunch-shifts can fit the working schedule, can even be shortened without discomfort. Management has fewer personnel problems where men who work together . . . break bread together!

Look into plants where minutes count—and you'll find Pick-planned, Pick-built cafeterias. Pick Engineers have had unequalled experience with mass feeding, under all conditions. They'll gladly sit down with you to study your problems and offer suggestions to fit your needs, your space, your budget. This entails no obligation. Send for our illustrated booklet No. PC8.

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FEEDING EQUIPMENT
For War Industries

THEY SAY AND DO

One Year of War Costs More Than 1917-18

Measured in money, the magnitude of today's war simply dwarfs the outlay that seemed so gigantic when the nation emerged from the world conflict of 1917-18.

In the year since Pearl Harbor, Uncle Sam has spent $46,393,890,525 for war purposes, a figure far exceeding the total cost to the nation of its participation in the first World War. The latter figure, according to latest Treasury estimates, is $40,583,062,000—which, incidentally, is one of the highest price tags ever put on the 1917-18 struggle by any of the various government and other agencies that have attempted to reckon its exact cost.

On the other hand, 1942's figure of $46 billions-plus is considered conservative and may be materially increased when all the returns are in. And the estimates of 1943 expenditures will eclipse not only those of the World War but those of 1942. By present reckoning, our war outlay in the new year will exceed $78,000,000,000 and may go even higher.

By far the greatest portion of 1942's expenditures was made by the War Department, of course. Its share was estimated at $25,383,464,511. But the Navy broke the pattern of old-style warfare by disbursing no less than $12,851,455,689. In the past, it has been considered logical to predict that naval construction would be greatly curtailed—on the heavier items, at least—because battleships could not be completed within the probable period of the war. Today the speed-up in naval construction methods has rendered this theory obsolete. Plus this, naval aircraft and aircraft carriers, built in enormous quantities, have had prime priority status since the start of this war.

Another current figure which totally overshadows the World War effort is the expenditure for the Maritime Commission's vast merchant shipbuilding program, by far the greatest in history. In 1942, the Maritime Commission spent $1,426,991,798, and is expected to exceed this threefold in the coming year.

The National Debt

The nation's hope of putting this war on anything resembling a pay-as-you-go basis went glimmering early in the game, just as it did in 1917. Here again the difference in the national debt wrought by the war is emphasized by contrast.

When the United States entered the World War, in 1917, it had a gross debt of about $1,500,000,000. In the first year of participation, the figure leaped above $11,000,000,000 and at the end of the war stood at $19,438,773,022.

In this war the pattern remains the same but the figures are stupendously larger. The expenditures of 1942 all but doubled our already huge national debt. On the eve of Pearl Harbor America's public debt totaled $55,231,154,812. On December 5, 1942, the Treasury released an estimate of the current figure at $103,577,860,314. And with monthly war expenditures running at accelerated rates now estimated at close to $6,000,000,000, the total is certainly destined to move upward again in 1943 no matter what tax and revenue measures may be taken.

The war bids fair to make Uncle Sam a much bigger debtor than the combined individual and business enterprises of the nation. Prior to the war private obligations still exceeded those of government.

•

Role of Leadership Seen for Engineers

America's engineers have been paid a high compliment in the form of a very serious challenge.

Both compliment and challenge were ennunciated at the recent annual meeting of the American Society of Mechanical Engineers by the Society's president, James W. Parker of Detroit, at the 63rd annual ASME banquet in New York.

"The times are crying out for spiritual leadership," Parker declared. "Upon the trained thinkers of the nation is laid the responsibility for producing that leadership."

The essence of Parker's challenge lay in his assertion that the American people are getting a better conception of "their duty to choose men of intellectual and moral capacity," and in his expressed belief that "we can no longer afford to delegate leadership to our professionalized politicians and economists."

The compliment was implied throughout his address, which appeared to suggest that the nation's engineers would be capable of replacing politicians and economists in the post-war future if they can develop the necessary quality of spiritual leadership.

"We seem in these latter days to have departed not a little from the paths we laid out for ourselves when we were a younger people," Mr. Potter declared. "We have left undone many things which we ought to have done; our courses have been determined too often in a spirit of sheer selfishness. We must own to a share in the responsibility for troubles that have overtaken the world since the armistice of 1918. Americans have come closer to a wider understanding of these days in facing the dark realities confronting us since the Japanese attacked at Pearl Harbor.

"With a clearer perception of the terrible responsibilities laid upon the nation's leaders in this time of great crisis, has come a better conception of

THERE IS NO EXCUSE

FOR BEING A *SCRAP SLACKER!*

Your country still needs scrap metal—in spite of all stories to the contrary. And you've got the kind that's needed most!

What are you doing about it? Are you making excuses and marking time? Or are you going ahead with a real scrap program in your plant—one that will get these dormant materials into the war in a hurry?

That's what you've *got* to do. Don't be content with simply selling your production scrap. Get out the idle and useless machinery, the old tools, dies, parts and fixtures. Tear down abandoned structures.

Read these questions and answers. They will give you the straight dope on the entire scrap problem. Read them even if you think you have already done a good job. Then go to work and really *scrap!*

1. Why this big fuss about scrap?

New steel is half pig iron and half scrap. We are making millions of tons more steel than ever before. Then too, in normal times a good percentage of all steel eventually finds its way back to the mills as scrap. But today, steel goes overseas as weapons—and none comes back.

2. Can't the mills use a smaller percentage of scrap?

It is possible to make steel of pig iron alone. *But* to make one ton of pig iron takes ½ ton of limestone, 1.2 tons of coal, and 2 tons of iron ore. It is impossible to mine and transport enough of all these to replace even a small percentage of scrap.

3. Why do some local scrap piles still stand?

The American people came through magnificently with household scrap. But it was quickly found that this light material must be mixed with large quantities of *heavy* scrap, such as you have. Without your help, this flimsy scrap cannot be used in quantity.

4. How can I decide what to scrap?

Apply the ruling given in the box to everything in your plant. Not only machinery, but every single piece of idle metal on the grounds!

5. How shall I go about it?

Form a Salvage Committee and put a Salvage Manager in charge. Select a high executive for this job—one who has the authority to make decisions and to buck unthinking opposition. Go over your plant with a fine-tooth comb, marking what is to go. Then see that it goes!

6. Suppose I've already done the job?

You haven't! No matter how well you've done, it's been proved you can turn up much more. This is a continuing job, just as it is a continuing need. Try again and you'll be amazed at the results.

WHAT IS DORMANT SCRAP?

Obsolete machinery, tools, equipment, dies, jigs, fixtures, etc., which are incapable of current or immediate future use in the war production effort because they are broken, worn out, irreparable, dismantled or in need of unavailable parts necessary to practical re-employment.

FOLLOW THIS RULE

If it hasn't been used for three months, and if someone can't prove that it's going to be used in the next three — sell it — or scrap it!

7. Is scrap deductable from my income tax?

This is important. If the item you scrap still appears on your books, it can be deducted. If you have already fully depreciated it, it cannot. Consult your accountant or attorney.

8. What if the material is still usable?

Find a buyer for it. Your scrap dealer or a used machinery dealer will buy usable material and equipment at higher than scrap prices. This includes pipe, rails and the like, in good condition.

9. To whom shall I sell my scrap?

If you don't know of a scrap dealer, look in the classified phone book. Dealers are glad to get heavy industrial scrap. Sort it according to materials, and separate the usable items from the mass—you will get higher bids. If the tonnage is high, you might get competitive bids from more than one dealer.

10. Do I have to sell it to a scrap dealer?

Yes. No one else is set up to sort and process scrap. This is an unbelievably difficult task, as there are 75 recognized grades of steel alone. As to profits—of course he makes a profit. He is a businessman just like you, and like you, his prices are regulated by government ceilings.

• • •

Don't hang onto things simply because you may need them after the war. A lack of scrap can lose this fight—and then what good will you get from the stuff you have hoarded?

BUSINESS PRESS INDUSTRIAL SCRAP COMMITTEE

ROOM 3303, EMPIRE STATE BLDG., N. Y. C.

If you have done a successful salvage job at your plant, send details and pictures to Factory Management & Maintenance.

SEND FOR THIS SCRAP MANUAL TO HELP YOU TACKLE THE SALVAGE PROBLEM

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From raw materials to finished products in every handling operation, American MonoRail Equipment is putting hands to best advantage. (Both clock hands and workmen's hands). Lifting, carrying, loading and unloading are done in less time and with less manpower, skilled workmen are thereby made available for more production work. American MonoRail Equipment reduces accidents, reduces fatigue, increases efficiency, keeps materials on scheduled routes and results in savings of money as well as time.

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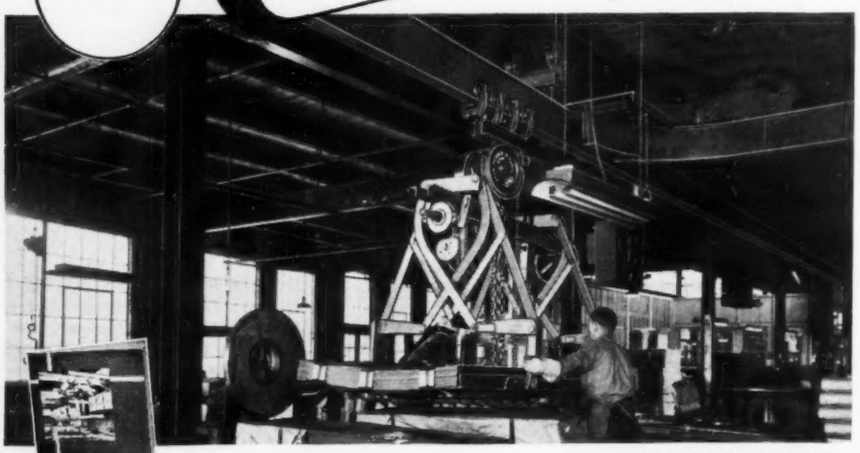
● Unloads and weighs steel to storage in half former time.



ONE LESS MAN NEEDED

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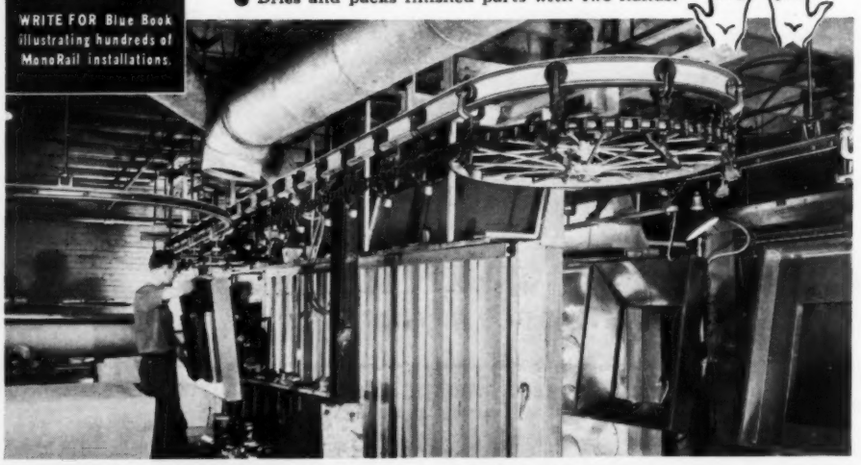

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the people's duties to choose men of great intellectual and moral capacity. There is no lack of reverence now for the memory of Washington and Grant and Lincoln and the other great statesmen of the nation's past. But we begin to see that even these men only reflected the will and stamina of the people themselves. It is by the decisions of the whole people that the nation's courses are determined. Some of these decisions are made instinctively; some of them are the result of wise leadership. We can no longer afford to delegate that leadership to our professionalized politicians and economists.

"Engineers are asking themselves whose duty it is to combat false doctrines; and to that question there can be for us only one answer. The conclusion is inescapable, that the people of America are being amalgamated by the pressure of great events to an extent we ourselves do not yet realize.

"They are united in a great common cause. I believe devoutly that our people are turning back to the ideals and faith of their fathers, inarticulately but nevertheless surely. The times are crying out for spiritual leadership. Upon the trained thinkers of the nation is laid the responsibility for producing that leadership."

•

Survey Traces Trend Of Labor Shortage

Total employment hit a new record high of 59,500,000 in October—a gain of 300,000 over September—while the continued expansion of the armed forces and the mounting demand for factory personnel gave every evidence of driving the total still higher.

That is the conclusion of a National Industrial Conference Board survey recently released. The Board finds that October employment stood fully 10,000,000 above the like period for 1940 which brings total employment to a figure of about 4,000,000 above previously estimated peacetime labor forces. The Board further estimates that 22,500,000 men and women are now directly engaged in war work or in uniform.

This means about three out of every eight employed.

"Labor shortages have already been encountered in 102 of the nation's largest population centers, including virtually all major war production areas," the Board asserted. "Similar shortages are anticipated shortly in an additional 77 cities. Official forecasts indicate that almost 6,000,000 more persons must join the labor force by the middle of 1943. About half of these will be required to offset induction into military service, while the remainder must be added to the personnel of war and essential civilian industry.

"Almost 60 out of every 100 persons above 14 years of age are currently employed or in uniform. By midsummer of next year nearly two out of every three persons in these age groups will be actively engaged in the war effort, or about

as high a proportion as that prevailing in Great Britain recently. In contrast, only about half of the productive forces of the population of the United States was at work two years ago.

"Employment gains were most pronounced during the month in the service industries (including the armed forces). Well over 500,000 were taken on in this group. Substantial gains during the month were also recorded in manufacturing and distribution. The total number engaged in trade and distribution, however, remained fully 400,000 below the record levels of last October.

"Farm employment was cut short by 250,000 as fall harvesting was completed. The number of hired workers at the end of October was less than in either of the two previous years. Losses of hired workers were most pronounced in the northeastern area. Farm-hand family workers, however, numbered only 0.8 per cent less than in the preceding month, comparing favorably with peacetime levels.

"With the exception of services, manufacturing, and trade, the level of employment was reduced in all major forms of non-agricultural activities. More than 100,000 workers were released from construction projects during the month, and small but significant increases were also apparent in mining, transportation, and public utilities."

•

Engineering Students Get Award

Undergraduates and graduates of technical universities have been given a new chance to share cash rewards for diligent engineering study.

The first $6750 Annual Engineering Undergraduate Award and Scholarship Program has been announced by its sponsor, The James F. Lincoln Arc Welding Foundation. This project is quite separate from the $200,000 Arc Welding Award Programs announced in 1937-38 and again in 1940-42.

The object of the Foundation's new project, as expressed in rules and conditions governing participation, is to encourage engineering students to study arc welded construction, "so that their imagination, ability, and vision may be given opportunity to extend knowledge of this sort and thus aid the war effort and the economic reconstruction in the peace which is to follow."

The program offers $5000 in student awards and $1750 in scholarships for the departments of the institutions in which the award-winning students are interested.

There are 77 student awards—a first award of $1000, second of $500, third of $250, four awards of $150, eight of $100, twelve of $50, and fifty of $25.

There are seven scholarships of $250 each. The school of the first award winner will receive four scholarships totaling $1000; the school of the second winner will receive two scholarships totaling $500; and the school of the third winner will receive one scholarship of $250.

The winning students will receive an

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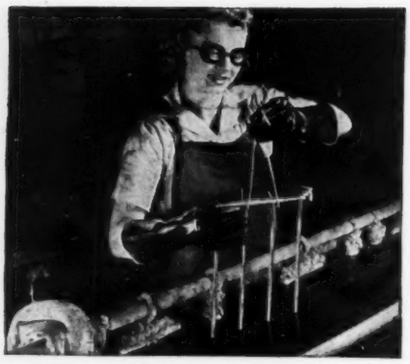

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Casualties on the industrial front have become a national menace. Act now to keep safe the busy hands of your men and women workers. Stanzoils of DuPont's miracle neoprene give surer protection, resist attack of oils, acids, dangerous substances, often last 3 to 7 times longer than rubber. Relieve dermatitis of hands, caused by rubber gloves. You save costly liability claims *and* precious work-hours of vital skilled hands. Neoprene Stanzoils are not a rubber "substitute"; they're a better material, as hundreds of industries have found. Write for current data on deliveries.

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additional honor, since the scholarship in his school will be given his name as: "The John Doe Scholarship of the Lincoln Foundation."

Any resident engineering undergraduate student registered in any school, college, or university in the United States giving a course in any branch of engineering or architecture leading to a degree, or any cadet registered in the United States Military Academy, United States Naval Academy, and Coast Guard Academy is eligible to submit a paper in the award program.

The awards will be made for papers describing the conversion from other methods to arc welded construction of parts of machines, complete machines, trusses, girders, or structural parts. The subject may be something which the student has observed in school shops, magazines, books, printed matter, or elsewhere; or he may conceive of a subject which has never been built but could be built by arc welding. The Foundation encourages the preparation of the type of paper which will not interfere, seriously, with the student's regular college activities.

It will not be necessary that the machine or structure or part be actually built, but the method of construction or the design must be described in the paper.

A paper may be submitted by any group of students but no one student or group shall participate in the writing of more than one paper. Each student author, or group, must have actually organized and prepared the description or design, which is presented in the paper.

If the paper covers a project, the project may have been started before December 1, 1942, but it must have been completed within the period from December 1, 1942, to April 1, 1943.

The jury of award will be drawn from various branches and institutions of engineering education. Selection of the jurors will be under the direction of Dr. E. E. Dreese, chairman of the board of trustees of The James F. Lincoln Arc Welding Foundation. Dr. Dreese is head of the department of electrical engineering of the Ohio State University.

Other members of the Foundation Board of Trustees are: W. B. Stewart, senior partner, McKeehan, Merrick, Arter, & Stewart of Cleveland; H. R. Harris, vice-president, The Central National Bank of Cleveland.

Further details of the $6750 Annual Engineering Undergraduate Award and Scholarship Program may be obtained by writing The James F. Lincoln Arc Welding Foundation, P. O. Box 5728, Cleveland, Ohio.

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Prepare Now for Peace NAM Head Urges

Industry has an obligation to begin planning now for the postwar period rather than leave the job to the government, in the opinion of Frederick C. Crawford, new president of the National Association of Manufacturers.

This was the keynote of Crawford's first major address, delivered to the Union

Here's one Answer to the

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Don't let your floors take a beating for lack of maintenance man-power. With longer-lasting Car-Na-Var treatments, a bare skeleton crew can keep them in tip-top shape . . . yes, better than ever before.

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OVERDUE ORDERS REDUCED 78% with McCASKEY PRODUCTION CONTROL in the first few weeks of operation

ABILITY to forecast delivery dates and check production to assure on-time deliveries caused constant concern in the plant of a well-known manufacturer of power transmission equipment until recently. Some idea of their situation is evident from the fact that this company operates 70 classes of machines and averages approximately 1300 unfilled orders with 500 in operation at one time.

To achieve their objective it was necessary to provide a machine load record showing the hours of work assigned ahead for each machine or group of similar machines, departmental work assignment in the shop in proper sequence for established schedules, and progress records instantly available to show the current status of each order.

Adoption of the McCaskey system of Production Control provided all the information desired and also brought to light glaringly unsatisfactory conditions which in the first few weeks of installation and operation were corrected to the extent of reducing overdue orders from 192 to 42. With the full operation of the McCaskey system overdue orders will be entirely eliminated or under control.

A McCaskey representative, qualified by training and experience, is available to help you work out your production control requirements. Call him in. No obligation, of course.

TYPICAL NEEDS SATISFIED BY McCASKEY PRODUCTION CONTROL

. . . Flow of finished parts coordinated to avoid assembly delays resulting from missing units.

. . . Progress record showing immediate status of any or all orders *at a glance.*

. . . Forecast of production delivery.

. . . Overdue orders eliminated or under control.

. . . Machine scheduling, departmental machine loads and job assignment to keep all machines busy all the time and run jobs in proper sequence.

. . . Check of machine production to assure realization of production standards.

. . . Production follow-up without dependence on stock chasers.

. . . Day to day cost and payroll data for immediate control of unexpected increases.

. . . Unified control of inventories of material, purchased parts, parts produced, sub-assemblies, tools, supplies, etc.

. . . Tool crib control providing more production with less tools.

These typical control objectives suggest in general what may be accomplished through McCaskey. Although the specific needs of plants and departments differ, the flexibility of McCaskey Production Control makes it adaptable to practically any of the severe production conditions existing today. You name your requirements and McCaskey will satisfy them.

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McCaskey Systems Ltd., Galt, Ontario, Canada — *The McCaskey Register Co., Watford, England*

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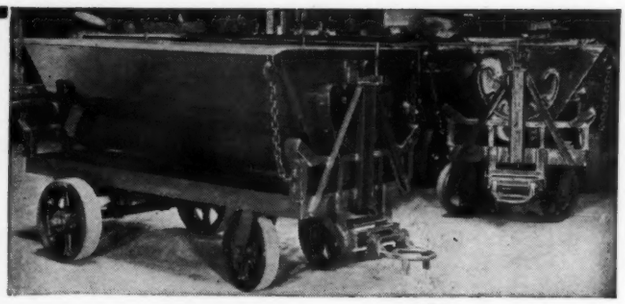

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80 page question book attached. Arranged for student to answer 10, 20, 25 questions on each blueprint. Many other features. Write for approval copies.

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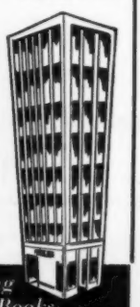

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Also makers of Foley Saw Grinders, Setters, etc.

League Club of New York, following his election at the NAM's 47th annual session, the War Congress of American Industry.

Reserving management's right to make "hard-hitting constructive criticism," Crawford called for the wholehearted cooperation by industry in government's war and postwar effort. He urged an "international concept of economics" on the part of management as well as government, declaring that industrialists must become world traders, "just as our politicians will have to become world statesmen."

"These United States must either accept that world position politically, socially, commercially, and militarily, or break faith with those who valiantly lead us to victory," he declared. He termed it management's responsibility to back government in every measure to guarantee against another world war.

"If this means big nation policing, I am for it," Crawford asserted, "despite the economic burden it will require to maintain an international police force. I believe that the nation must participate as well in the economic rehabilitation of our sister nations after the war is over. This, however, is not a policing job to be done by the government but an opportunity for private capital and private initiative."

Private capital must likewise plan now for its postwar operations "to the greatest possible extent without detracting from the war effort," Crawford warned. He pointed out that if postwar recovery measures are financed totally by government, a new debt will fall upon the people.

"Despite the altruism of the American people, I do not believe they will allow themselves thus to be impoverished," Crawford said. "Especially so when private capital can do the job to the benefit of those in foreign lands and with profit, through prosperity to every American citizen."

Hoover Speech Highlights

The NAM's annual meeting produced even more than its share of significant speakers this year. Not the least of these was former President Herbert Hoover who stated firm views on the conduct of the war effort, warning that "failure in organization and strategy on the home front may be as disastrous as failure in organization and strategy on the military front."

Hoover enunciated 12 principles as his recommendations for the formation of home-front economic shortage.

"The first of these principles for democratic countries is that all civilian activities should be directed by civilians and within limitations laid down by the legislative body. Otherwise we shall be in a military dictatorship with all its implications.

"The second principle is that civilian activities must be directed by single-headed administrators. In every country in the last war—and in this war—the United States, Britain, France, and for that matter, Germany, all boards, committees, or commissions proved a failure except in advisory or judicial functions. Especially in war do we need leadership,

Garlock

"...and we're depending on you!"

We at home are relying on the courage of our fighting men to protect the things we hold dear. But courage alone cannot win battles. Our men are counting on us for a continuous supply of guns, shells, tanks, ships, planes, bombs, food.

Let's not let them down. Let's maintain peak production by avoiding waste, working hard and buying War Bonds!

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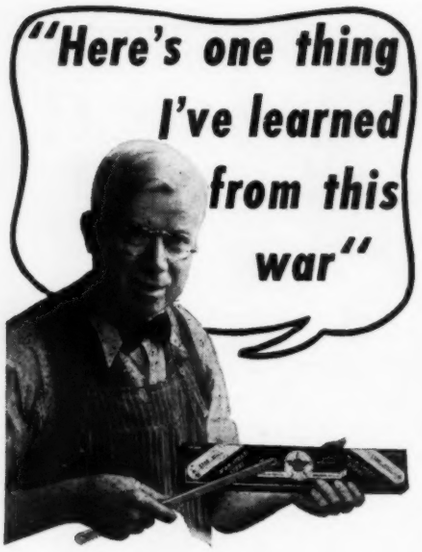

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and leadership comes from individual men. That basis of organization is, in fact, inherent in our federal government itself. It is the experience of 150 years in the whole productive economy of the United States. We can no more administer civilian activities in war with a committee than we could direct a battle with a committee.

"The third principle is that all functions and authority in respect to a particular activity must be concentrated into the hands of one administrator. We can no more have an administrative job divided over several independent men than we could conduct a battle with several independent generals. The problems of production, distribution, conservation, and price-fixing in any particular material are interlocked. The same single head must direct all these functions. For instance the munitions administrator, whatever his title, must have many subadministrators, but each should have all the authority and all the functions that relate to his particular job. Likewise there should be head administrators of food, fuel, labor, shipping, transportation, and finance, as well as the Secretaries of War and Navy.

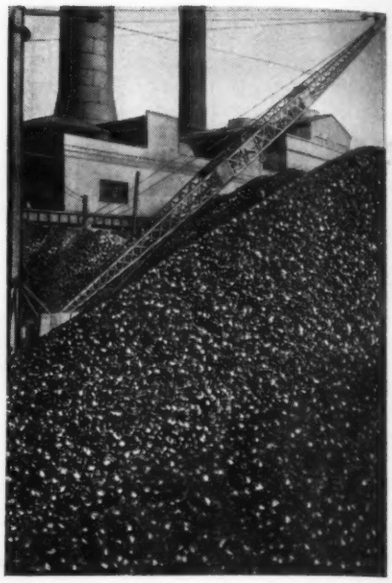
"Fourth—the head administrators of such major groups should comprise a war council sitting directly with the President. Here alone the general economic and civilian policies should be determined, the conflicts and overlaps planed out with the President as final umpire. There was a War Cabinet or War Council in every principal nation in the last war. There is one in every principal nation today, except in the United States.

For Maximum Production

"Fifth—the first civil necessity of total war is the maximum production of war essentials. Increased production is the best answer to shortage and all the mechanisms of price and controlled distribution must be focused toward increasing production. If maximum production is to be secured, the high cost producer must be brought into action. And with drastic taxes on excess profits, the low-cost producer does not get away with anything consequential. To secure maximum production there must be no rules of labor that restrict or retard effort or output beyond those which safeguard health.

"Sixth—There are some principles or policies in assignment of manpower. We can better appraise our manpower if we calculate the male manpower available and assume that women can do the rest. There are certain jobs that only men can do. There are jobs that are beyond the physical strength of women. There are jobs that require long training and skill for which there is no time to train women. The number of males between 18 and old age is a positive number and there is a considerable number who are unable to work. If we compute the males necessary to carry on the government, the professions, the farms, the transportation, the mines, the skilled crafts, and to fight, we will find certain limitations on what we can do.

"We have undertaken seven major jobs: To raise military forces; to equip them; to



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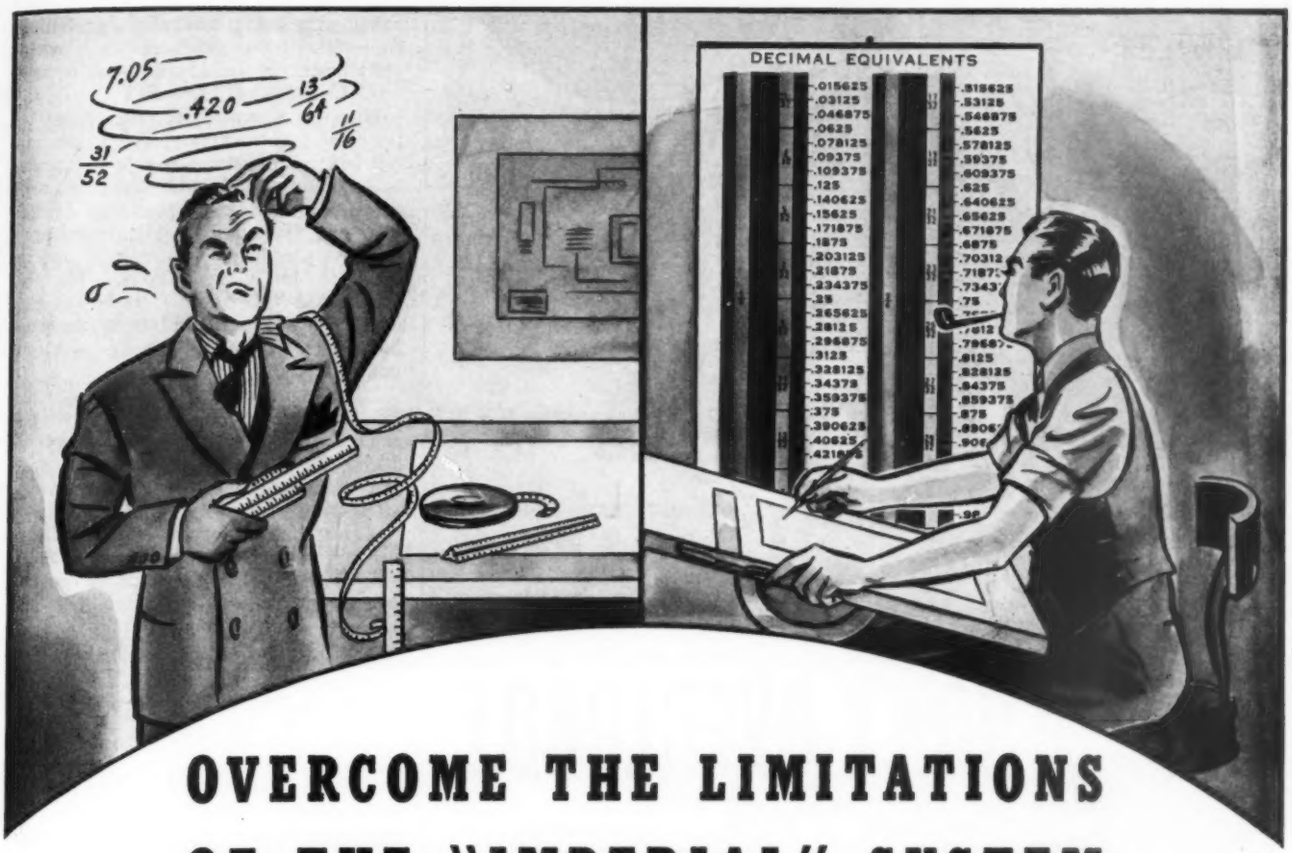

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- The "YARD" . . . originally the circumference of a man's body, later the length of the first King Henry's arm . . . still later became a multiple of the foot.

- The "INCH" . . . the length of 3 barley corns . . . later became 1/12th of a foot.

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build transport ships and a navy; to furnish our allies with ships and men; to furnish food to our allies; and, finally, to support our own civilian population. We have to divide our available manpower between these fields. And we must choose which of these jobs we will give priority for the long view of winning the war.

The seventh principle relates to control of inflation and justice in distributing short commodities. That involves price fixing, wage fixing, controlled distribution, conservation, and rationing, all of which are inherent in the adminstration of total war."

Hoover recommended the fixing of prices of a given commodity or raw material at or near the source of production as possible and to regulate the subsequent percentage addition for processors and the mark-up for merchants. He assailed price ceilings as a drag on production and an incentive to black markets. He also condemned "job freezing" as "a violation of the constitutional freedom of men from involuntary labor." Hoover's final four points follow:

"The eighth principle of war organization is to do no more regulating than is necessary to attain the major objective. Fixing of prices is necessary only upon the things the government uses or that comprise the essentials of living. . . .

"The ninth principle relates to the necessity to change from the normal bid and contract peace practice of governmental purchases of commodities and services. That safeguard cannot be made universal in war. But a great measure of successful alternative was found in the system of allocations first developed in the last war. . . .

"The tenth principle is to secure the enthusiastic cooperation of the civilians with the government in order to mobilize their abilities, skill, and sacrifice with the least bureaucracy and force. . . . The American people respond better to the statement of a need under the words 'please' and 'serve' than they do under the word 'verboten.'

"The eleventh principle applies to the concentration of every governmental energy upon winning the war. Reforms, or making America over, no matter how attractive, cannot but dislocate the war effort.

"The twelfth, a major principle, is to organize all these activities so as to assure the return to economic and personal liberty the minute the war is over. Civilian war organization is economic fascism itself, and if democracy is to live, these measures must be dissolved."

•

Service Men Listed Among Inventors

America's men in the armed services are making contributions of their own to the mass of new inventions that are helping to win the war—and, incidentally, to brighten the prospects of a post-war period made potentially more profitable by technological advance.

In this month's crop of new registrations at the U. S. Patent Office two men

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These green signals tell the month through which material production has been scheduled.

MATERIAL CONTROL DATA

The amount of material in inventories is graphically translated into the weeks or months of stock available against previous monthly consumption figures . . . or as actually scheduled into production.

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Remember!

VALVES
HYDRANTS
Need Regular
INSPECTION

Due to rapidly changing personnel on account of employees going to the Army and Navy, valves and hydrants may now be sometimes in the hands of persons not very familiar with their proper care. We offer the following suggestions:

GATE VALVES

All Gate Valves in water lines should be inspected at least twice per year, more often if possible. Most of these valves stay continuously in open position. Unless inspected, a valve might remain open for a number of years. Then in case of emergency, the valve might be found inoperative. An inspection should consist of opening and closing the valve several times to see that it is in perfect working order, and gland bolts should be tightened if there is any indication of leakage after inspection.

FIRE HYDRANTS

The above suggestions also apply to Fire Hydrants. In addition, Fire Hydrants should be flushed out at least twice per year to remove foreign matter that might collect, thus making the hydrant difficult to operate or might clog nozzle of fire hose.

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FIRE HYDRANTS
GATE VALVES
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in uniform are represented by ingenious inventions.

One of these devices, having a direct military application, is the work of a soldier. The other, helpful in naval operations, was developed by a member of the United States Navy.

The first offers a method of training young artillery officers more economically than the present method. Most practice firing is done on a miniature range, using regular gunsights and laying mechanisms but shooting small caliber ammunition. The new method would utilize compressed air instead of gunpowder, further reducing costs and eliminating the work of cleaning the gun barrels. The invention is the work of Capt. Harry E. Mikkelsen, stationed at Fort Breckenridge, Ky.

The second, registered in the name of Richard B. Comstock, an enlisted man in the Navy, is called a diving face-plate for shallow-water work. For all depths of less than 50 feet, the inventor says, the apparatus can replace the present cumbersome and costly copper-helmeted regulation diving suit.

Comstock's device consists of an oval frame, deep enough to cover a man's face, with a sponge-rubber cushion around the edge to make a water-tight contact, a glass window to see through, and straps to hold it firmly in place. A hose connection at the top supplies fresh air; foul air passes out of a pair of water-excluding valves at the bottom.

Both Comstock and Captain Mikkelsen have relinquished all rights, royalty free, to the U. S. government.

A third invention of the month has significance to the war effort and to aviation research generally. This is simply a new type of seat for airplane pilots, the aim of which is to enable dive bombers and test pilots to pull out of power dives with less trouble from the "blackouts" which sometimes cause them to lose consciousness.

These "blackouts," which are due to violent and sudden changes in blood circulation to the brain, are doubly dangerous because they often cause the pilot to lose control of the plane at the most critical point of operation.

Finding that the "blackout" is worse when the pilot is sitting in an upright position, the inventor has contrived a seat with a hinged back which lets the pilot assume a supine position as the plane swoops steeply down and then steeply up. Behind the hinged back is a hydraulic cylinder which acts automatically to restore the seat (and the pilot) to normal sitting position.

The inventor is Frederick P. Dillon of Los Angeles. He has improved on his own device with an additional mechanism which automatically relieves the pilot of his control the instant he releases his bomb and turns the job over to the gyroscopic control until the danger of "blackout" has passed.

The recent order of the Office of the Alien Property Custodian, releasing for American use some 27,000 patents owned by enemy aliens, has been of great interest to American manufacturers who are now free to utilize these by taking out licenses from the patent office.

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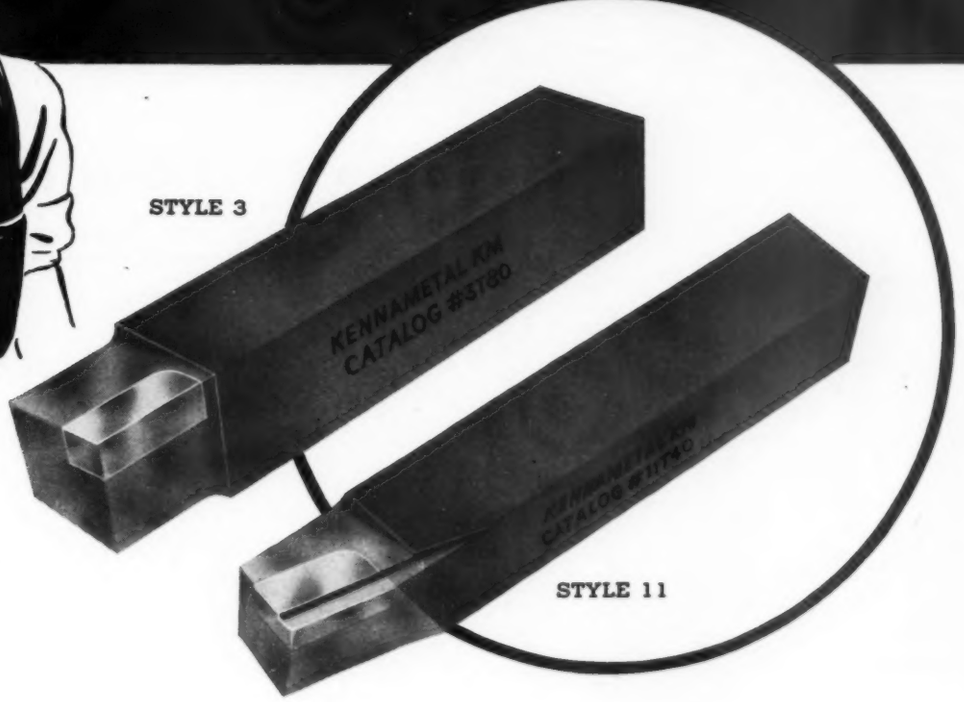
Tom the foreman says:

"Use Chip Breakers in KENNAMETAL* tools Only When Necessary"



"YOU fellows are asking that chip breakers be ground in practically all of your carbide tools. This is a mistake. Chip breakers are often times 'necessary evils' but even when necessary are evils just the same, so, when you don't absolutely need them, don't use them.

"Always remember that 'chip breakers' of any type CONSUME MORE POWER in removing the same amount of metal per minute. The increased horsepower required is an additional load on the tool (as well as the machine), resulting in MORE RAPID TOOL WEAR. This is wasteful.

"You will frequently find that tools WITHOUT chip breakers will carry a faster speed and heavier rate of feed, reducing the machining time of the job and the wear on tool and still stay well within power limitations of the machine.

"And again, you fellows should remember that tools without breakers are much easier to maintain. For instance, diamond wheels are required for chip breaker grinding, and they are expensive, so, if you don't have breakers, you save diamond wheels and also the time required for grinding.

"Let me tell you some figures we got on the 155 mm. shell turning job. We were turning shells at about 260 ft./min. cutting speed with .018" feed, with tools having chip breakers, and the wattmeter showed about 57 horsepower consumed. We put on the same tools WITHOUT chip breakers, with identical speed, feed and depth of cut, and the wattmeter showed only 45 horsepower, but the chips did not break. So, we increased the feed to .024" at WHICH FEED THE CHIPS BROKE SATISFACTORILY, and the wattmeter showed power consumption of 54 horsepower. So you see, cutting out the chip breaker INCREASED PRODUCTION, SAVED POWER, SAVED TIME, SAVED DIAMOND WHEELS AND INCREASED TOOL LIFE.

"Let's make it our rule to use chip breakers only when necessary, not as regular practice."

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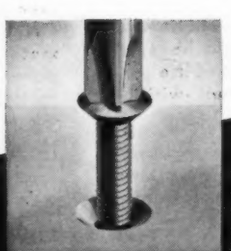

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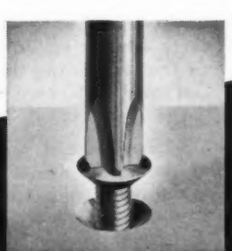

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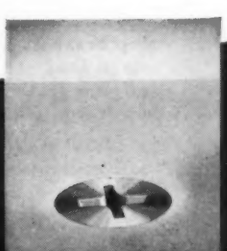

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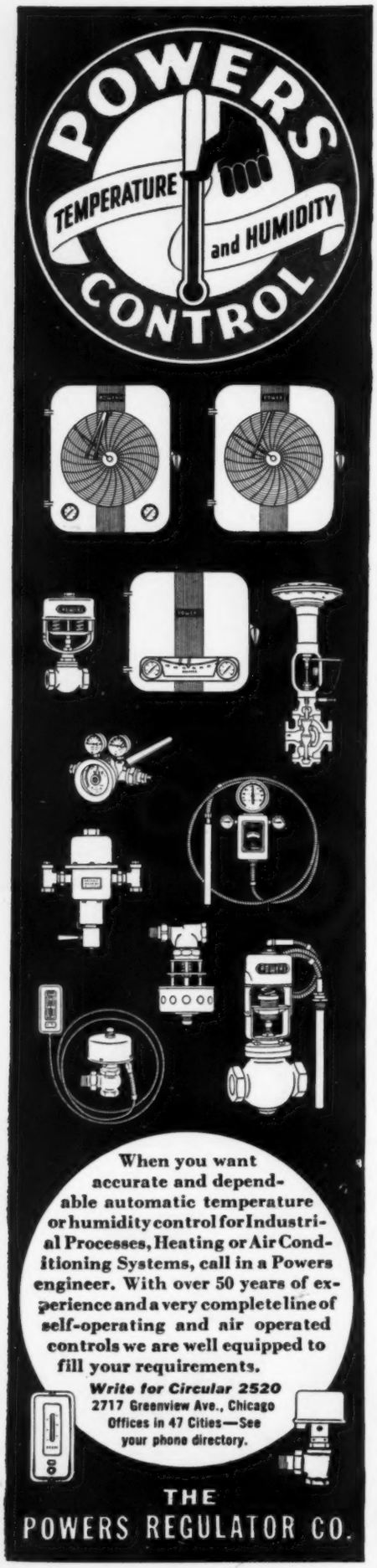

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ANNEALING MACHINES—For steel cartridge cases brought out in an exhibit at the recent Metal Congress Meeting in Cleveland. Bulletin No. 261 describes the machine in detail, complete with blueprints, and approximate speeds. Morrison Engineering Corp.

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★ Priority rated orders for Acme Steelstrap and strap-applying equipment are shipped promptly... thus helping manufacturers meet close shipping and sailing dates! Complying with all Federal Strapping Specifications, Acme Steelstrap assures "Bound to Get There" arrival of important war products... conserves container material . . . speeds handling and cuts costs by making skid shipping practical ...reduces cargo space through the medium of baling compressible items such as military textiles and pulp. For every type of package ...box, carton, crate, bale, bundle or skid... and for bracing carload ladings, there is a type and size of steel strapping to protect the items of war. And for speedy strap application, you'll need Acme Steelstrappers . . . the fastest, one-piece strapping tools ever built. Get in touch with the nearest Acme office.

FREE HELPFUL LITERATURE.

ACME PROCESS NEWS . . . regularly issued, interesting and well illustrated 12 page publication on the strapping and bracing of war shipments.

STEEL STRAPPING SHIPMENTS . . . describes methods of steel strapping a wide variety of shipping packs.

ACME UNIT-LOAD . . . 24 page picture-filled informative booklet on the bracing of carload freight.

ACME SILVERSTITCHERS . . . low cost machines for stitching all types of cartons with flat wire.

Simple to handle, Acme Steelstrappers are easily and speedily operated by women workers! The strapping tool pictured tensions, seals and cuts the strap with a single movement of each of the two handles.

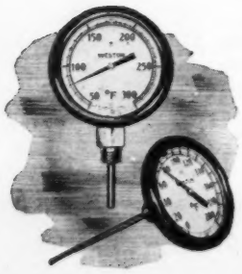
ACME STEEL COMPANY

2831 ARCHER AVENUE, CHICAGO, ILLINOIS

ATLANTA: 603 Stewart Ave., S.W. • **BALTIMORE: 339 St. Paul Pl.** • **BOSTON: 146 Summer St.**
DETROIT: 712 Book Tower • **LOS ANGELES: 4901 Pacific Blvd.** • **NEW ORLEANS: 309 Magazine St.**
NEW YORK: 103 Park Ave. • **PHILADELPHIA: 201 Lafayette Bldg.** • **PITTSBURGH: 418 Bessemer Bldg.**
PORTLAND (Ore.): 522 N. W. Davis St. • **SAN FRANCISCO: 432 Bryant St.** • **SEATTLE: 1025 Sixth Ave., S.**

Ruggedness and dependable accuracy, too, distinguish the ALL-METAL THERMOMETER

Readability in an indicating thermometer is an outstanding advantage *if* full dependence can be placed on each reading. Thus the WESTON thermometer has been widely adopted throughout the process industries: because it provides both these essential factors . . . readability and dependability . . . without compromise. It's simple, all-metal temperature principle . . . minus gases, liquids, capillary and involved mechanisms . . . assures "on-the-dot" accuracy over a far longer period of time. In addition, this all-metal construction safeguards against failures due to vibration or over-ranging. *You're more certain of your reading . . . with a* WESTON.



WESTON all-metal thermometers are supplied in types and diameters for most industrial applications and in stem lengths from 2½ to 24". Accuracy, over the entire scale, guaranteed within 1% for the industrial models . . . ½ of 1% for the laboratory model. Literature gladly sent on request, although production facilities are at present devoted solely to the war effort. Weston Electrical Instrument Corporation, 628 Frelinghuysen Avenue, Newark, New Jersey.

WESTON ALL-METAL *temperature Gauges*

a blow torch are labeled and lighting instructions and safety hints are shown in action pictures. The Turner Brass Works.

–9–

BRAKES—High-speed, shunt wound, magnetic brakes for cranes, hoists and mill machinery are discussed in 2-page Bulletin 1006. Brake formerly only for d.c. service is now available for operation on a.c. circuits by the addition of rectifier unit. The Electric Controller & Mfg. Co.

–10–

BRAZING AND SOLDERING—Bulletin illustrates the electric brazer for brazing and soldering with silver solder, the all-purpose soldering set, the "Thermo-Grip" for general soldering, the "Midget" for light soldering, and No. 10 heavy-duty size. Ideal Commutator Dresser Co.

–11–

CALENDAR—Built on a war week basis, with big black numerals that can be easily read from any part of the drafting room. Over-all size is 15¾x24½ inches. A section of technical data for engineer and draftsman, containing charts on wire and sheet-metal gages, screw threads, and so on, is included. Frederick Post Co.

–12–

CARE OF STEAM HOSE—Simple, easy-to-read rules for care and maintenance of steam hose are contained in Catalog Section 4500. Data on inside and outside diameters, weight and number of plies are listed. Also included are detailed instructions on the proper method to attach couplings. B. F. Goodrich Co.

–13–

CASTERS—Data sheet gives information about the Bond 40-A-H heavy-duty caster. Information is included on bearing balls, roller bearings and construction, pressure lubricating equipment, dimensions, and list prices and code. Bond Foundry & Machine Co.

–14–

CHAIN DRIVES—"First Aid for Faithful Chain Drives" is title of Folder 1951, which tells how to keep drives running when repairs or replacements are unavailable. Covers what to do for worn chain and worn wheels, and how to get new life from old chain pins. Seven servicing suggestions for longer chain drive life are given. Link-Belt Co.

–15–

COMPRESSORS—Design 9 centrifugal compressors—available in more than 200 sizes,

An Answer from the skies

"NO FOREIGN power can ever harm Germany from the air" was the boast of Hitler's air marshal. Yet today American planes, piloted by American airmen, are flying far into middle Europe, carrying loads of destruction to the mighty industrial plants—the huge utility system—the network of transportation lines that are all so vital to the Third Reich's military power.

This sky-borne answer to Goering's boast is dramatic proof of the quality of American planes—and the American engines that power them.

For as the size of these planes and the size of the loads they must carry have gone up—and up—and up—the engines that power them have kept pace. Today, motors of 2000 h.p. and over are an accepted fact with engineers looking forward to greater and greater horsepower in the motors of tomorrow.

What this increased horsepower means to the gears that transmit engine revolutions to the whirling propellers can well be imagined.

For aircraft gears must be light in weight, yet the slightest inaccuracy in gears revolving at such high speeds transmitting such great horsepower would quickly spell failure. No wonder aircraft engineers long considered such high precision gears a laboratory product.

But an air armada of the magnitude we are launching demanded that gears be produced by the hundreds of thousands.

That this problem was successfully solved is evidenced by the gears—thousands upon thousands of them—being daily turned out by the Precision Gear Plant of Foote Bros.—gears produced on a schedule that spells doom for the Axis ambition of world conquest.

And when the war is won, these new techniques and new methods that have made extreme precision in mass production possible promise a new era in the design of high speed machines for a peacetime America.

FOOTE BROS. GEAR AND MACHINE CORPORATION
5301 S. Western Boulevard • Chicago, Illinois

FOOTE BROS

Better Power Transmission Through Better Gears

One time when a girl says "Dammit" because she is a lady!

"...just because somebody hasn't figured out that more women mean more toilets, I either trot all the way back to my machine — or join the "standees". Either way, my machine is idle . . . and I'm burning up — again. And, mister, when I'm burning up — my production isn't!"

Sanymetal*
ALL-WOOD
Toilet
Compartments
With Complete
Door Hardware and
Partition Fittings

Skimping or neglecting toilet and washroom facilities invites time loss — indispositions due to irregular habits — high labor turnover — fatigue — resentment . . . particularly among women workers. For that reason, the beneficial effect of modern, adequate facilities–utilizing well designed toilet compartments that provide utmost convenience, sanitation and privacy on each worker's morale and production should never be underestimated. Utilize Sanymetal All-Wood Toilet Compartments and Sanymetal's *27 years of specialized experience* in providing toilet facilities for men and women workers.

SAVE TIME AND MONEY. No need to design your own or build makeshift toilet compartments. Sanymetal Engineers have worked out the most practical and economical design from the materials available today.

CONVENIENCE AND SANITATION is embodied in Sanymetal Toilet Compartments in a degree unappreciated and unapproached by those lacking Sanymetal's 27 years of specialized experience in building Toilet Compartments.

ENGINEERED-IN-WOOD FEATURES provide a strong, rigid installation and freedom from dirt collecting pockets and ledges.

ONE ORDER INCLUDES EVERYTHING you need *even the hardware and fittings* for the complete installation — partitions, doors, posts, headrails, hardware, fittings.

COMES READY TO INSTALL without trial erection or assembly of materials.

Write for Bulletin No. 900 for complete data on Sanymetal All-Wood Toilet Compartments. For quick action—see "Partitions" in your phone book for Sanymetal Representative.

NEED LOCKERS? Plywood and tempered presdboard lockers, developed by Sanymetal Engineers, are now available without delay. Write for Bulletin No. 920.

*Trade Mark Reg. U. S. Pat. Off.

THE SANYMETAL PRODUCTS CO., INC., • 1707 Urbana Road, Cleveland, Ohio

THE SANYMETAL PRODUCTS CO., INC., 1707 Urbana Rd., Cleveland, O.
Please rush new Bulletin No. 900 on Sanymetal All-Wood Toilet Compartments.

Name.....
Position.....
Firm.....
Address.....
City.....*State*.....

with pressures from ½ to 3 pounds, volumes up to 5500 c.f.m.–are discussed in 20-page Catalog 386-2. Performance tables, dimension diagrams, unit and installation photographs are shown, and a list of sales engineering offices is included. B. F. Sturtevant Co.

–16–

COMPRESSORS–in Action. Picture folder shows types of compressors and what they can do. Compressors at work for street repair, rural electrification, underwater weed cutting, asphalt and concrete cutting, and on other jobs. Schramm, Inc.

–17–

CONTROLS–Bulletin 836 pressure and temperature controls are used for pilot duty application, for the operation of contractors, or the direct control of small a.c. and d.c. motors. These applications are described and illustrated in recent 8-page booklet. Allen-Bradley Co.

–18–

COPPER–Comprehensive guidebook gives factual information on copper and copper alloys, technology and properties, welding technique, specifications, manufactured forms, and pipe and tube dimension and weights. Indexed and organized for easy reference. Gives information on consulting service equipped to help users of copper and alloys. Revere Copper & Brass, Inc.

–19–

COPPER–Handy calculator that works like a slide rule shows at a glance how much copper can be saved in a war-plant electric power system by installing unit substations at load-area centers. Reverse side of rules carries a chart showing percent increase in cable copper as voltage is decreased, also amount of cable copper needed to carry 1000-kva. load at various voltages over distances from 10 to 1000 feet. General Electric Co.

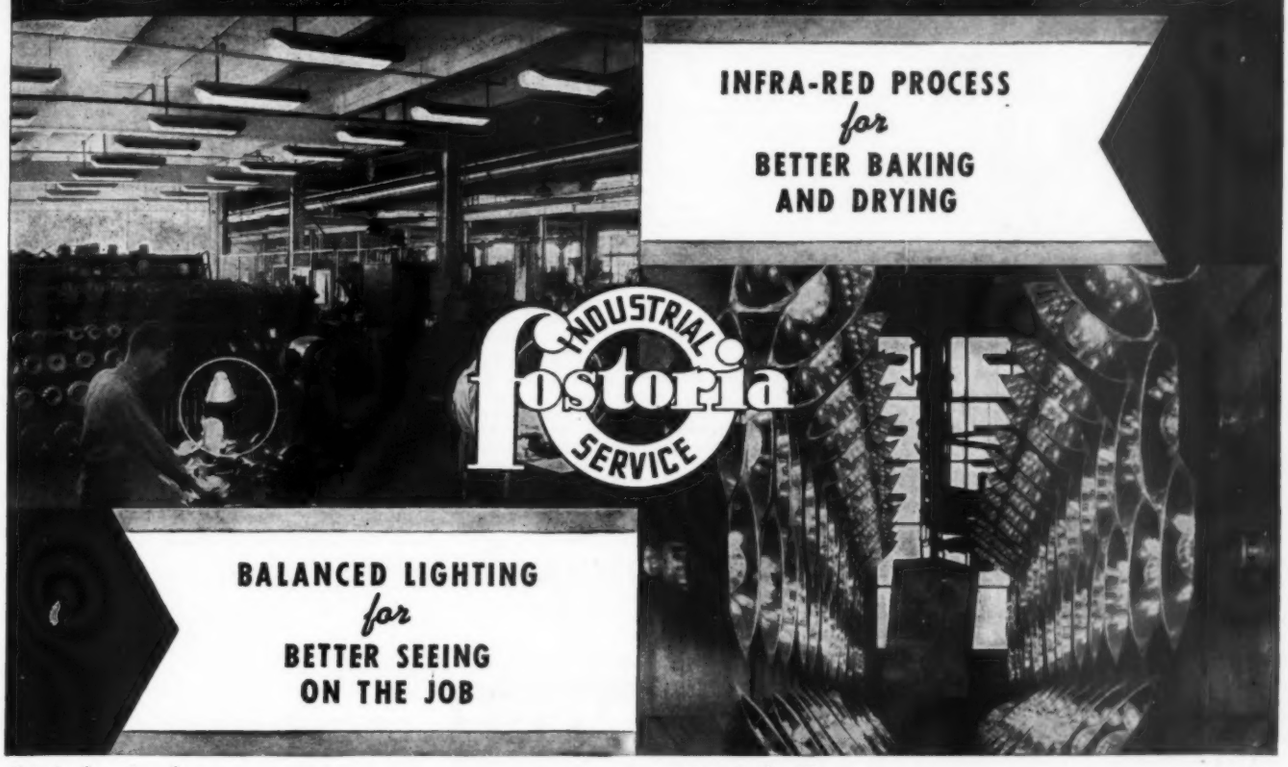
–20–

CRANES–Twelve-page illustrated Catalog 1943 is available on heavy-duty model LS-120 crawler shovel, crane, dragline. Shows construction details and installation views. General dimensions, clearances, lifting capacities, and specifications are given. Link-Belt Speeder Corp.

–21–

CRANES–Twenty-four page picture book "Whiting Products for Industry." Condensed but comprehensive facts on cranes, railroad and aviation equipment, cupolas and foundry equipment, quickwork products,

2 POPULAR SPEED-UP TOOLS



Vital Tool FOR SPEED AND ACCURACY

Close, accurate tasks on machines, benches, tables and similar work areas require 100 to 300 foot-candles and more of illumination for "seeing" efficiency. Only by "balanced" lighting—the proper combination of localized lighting for close-up illumination, and general lighting for background illumination—can "seeing" conditions of needed efficiency be obtained. To attempt greater illumination of individual work areas by overlighting general areas is both inadequate and uneconomical. Balanced lighting provides adequate light proportioned as needed. It is a less costly and highly efficient illumination system. Request a Fostoria analysis, today.

Vital Savings IN TIME AND SPACE

Only 7½ minutes to bake the finish on shell boxes compared to 4 hours for the former air-dry method. Accomplished by the Infra-red process, this amazing speed-up also saves many square feet of floor space. Visible operation, decreased spoilage and conservation of energy are further advantages. For drying, baking, preheating or dehydrating, Infra-red has greatly increased production efficiency for hundreds of war industries. Fostoria technical service provides full cooperation in pre-testing the advantages and adapting this new industrial tool to your requirements. Write, today, for case studies applicable to your product and the details of Fostoria equipment advantages.

THE FOSTORIA PRESSED STEEL CORPORATION, FOSTORIA, OHIO

Fostoria Products Manufactured and Distributed in Canada by Amalgamated Electric Corp., Ltd., Toronto, Canada

CALL OR WRITE YOUR NEAREST FOSTORIA INDUSTRIAL SERVICE STATION

For Counsel on Lighting and Drying Problems

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299 Techwood Dr., N.W. Phone: Jackson 1695

BALA-CYNWYD, PA.
The J. V. Calhoun Company
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Phone: Greenwood 4477 at Phila.

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(Div. of Copley Sales Co.)
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Fostoria Industrial Service
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CHARLESTON, W. VA.
Charleston Electrical Supply Company
Phone: 26-157

CHARLOTTE, N. C.
Mill Power Supply Company
300 W. 1st St. . . . . Phone: 6134-6137

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Fostoria Industrial Service
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1021 Chestnut St. . . . . Phone: 6-6194-5

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(Div. of Hyre Electric Co.)
741 W. Jackson Blvd. Phone: Haym'k't 8130

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Fostoria Industrial Service
(Div. of Harrison Tire & Rubber Co.)
Court & Race Sts. . . . . Phone: Parkway 2080

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Fostoria Industrial Service
4500 Euclid Ave. . . . . Phone: Endicott 6622

COLUMBUS, OHIO
Electric Power Equipment Company
57 E. Chestnut St. . . . . Phone: Adams 5215

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The Folsom Company
509 Elm St. . . . . Phone: Riverside 9803

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2615 12th St. . . . . Phone: Cadillac 0043-44

FINDLAY, OHIO
Fostoria Industrial Service
(Div. of Bearing & Transmission Co.)
211 N. Main St. . . . . Phone: Main 755

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National Mill Supply Company
207 E. Columbia St. . Phone: Anthony 2331

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Electrical Supplies, Inc.
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548 Massachusetts Ave. . . Phone: R. I. 2934

KANSAS CITY, MO.
Fostoria Industrial Service
Mfgrs. Exch. Bldg. . . . . Phone: Vic. 0770

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3690 Santa Fe Ave. . . . . Phone: Jef. 6294
Fostoria Industrial Engineering Service
(Div. of Quality Electric Co., Ltd.)
1235 E. Olympic Blvd. . . . Phone: Trin. 5981
Fostoria Industrial Service
(Div. of Leo J. Meyberg Co.)
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MILWAUKEE, WISC.
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104 E. Mason St. . . . . Phone: Daly 2949

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A Safer HAND CLEANER FOR HER? You Bet!

Her skin is more sensitive. Yet her hands get just as dirty as those of the men she replaces in your plant.

She needs a *safe* hand cleaner because she is even more subject to dermatoses and infections caused by harsh hand cleaning compounds than men workers. And, you know the heavy toll we have paid and are paying in lost time and priceless production due to industrial dermatoses!

For her hands, Magnus Superfine has the same speedy, safe cleaning action as Magnus Regular or Magnus Heavy Duty Hand Cleaner for men's hands.

All Magnus Hand Cleaners are free from the harmful abrasive action which is such a source of trouble with poorly chosen hand soaps. They contain no strong chemicals which rob the skin of natural oils. But, they clean hands in jig time, without needless and dangerous scrubbing or brushing. And, they rinse off completely, leaving soft, smooth hands which are less liable to chap or crack.

ASK FOR YOUR COPY OF BULLETIN 51

The *facts* about safe hand cleaning, without frills or sales pressure!

MAGNUS CHEMICAL COMPANY

Manufacturers of Cleaning Materials, Industrial Soaps, Metallic Soaps, Sulfonated Oils, Emulsifying Agents and Metal Working Lubricants.

Service Men in All Principal Cities

220 South Avenue **Garwood, N. J.**

Magnus CLEANERS

CUT MINUTES OFF Each Operation With the Help of EWC Trailers!

Today, one type of EWC Trailer is hauling hay to a stock yard, while another type is handling armour-plate for tanks.

No matter what materials you handle, EWC Engineers can help reduce your handling time and increase your handling efficiency!

The complete EWC Trailer Line—with its innumerable variations—provides the proper hauling equipment for floor, yard, interplant, or street; in any capacity desired and with any type of body.

WRITE FOR BULLETINS, Prices and Helpful Suggestions applying to your specific handling problems.

EWC

ELECTRIC WHEEL CO.

DEPT. FA **QUINCY, ILL.**

evaporators, filters, and various other products. Whiting Corp.

–22–

ELECTRIC HEATERS—and Heating Devices. Mail-order catalog featuring small electric heating equipment, thermostats, and controls complete with prices and ordering directions. Describes the midget heater which provides heat where exact temperatures are needed and in spots that otherwise could not be reached. General Electric Co.

–23–

EMBLEMS—trophies, plaques for a wide variety of industrial uses are listed in 6-page circular. Length-of-service pins, no-lost-time emblems, safety, safe driver, first aid pins are pictured. A "lost-time" goat, and a white elephant for the "worst accident" are suggested for departments whose records need improvement. Badges and honor roll plaques also are described. Williams Jewelry & Manufacturing Co.

–24–

EXPANSION BOLTS AND ANCHORS—Types and uses needed for construction and remodeling are illustrated in Catalog No. 42. Special bolts and accessories also shown. Prices listed. American Expansion Bolt & Manufacturing Co.

–25–

FILMS—How to present ideas with pictures is treated in four pamphlets. Picturol Catalog indexes many subjects available on 35-mm. filmstrips. The mimeographed supplement lists filmstrips for wartime training. Form D44-1-41 gives instructions for preparing original material for slidefilm production. "How to Show It" is a condensed description of projectors, with illustrations and price lists. The 1942 annual Visual Review contains articles on visual aids for defense and trends in education, religion, and trade. Society for Visual Education, Inc.

–26–

FIRE EXTINGUISHERS – Maintenance folder on caring for firefighting equipment. Gives directions for inspecting, recharging, and maintaining portable fire extinguishers. Illustrated cross-section names parts of extinguisher. Pyrene Mfg. Co.

–27–

FLEXIBLE COUPLINGS—Illustrated catalog covering every angle on couplings—installations, engineering data, dimension tables and diagrams, operation, lubrication, maintenance. A supplementary leaflet covers the

NO INTERNAL DISSENSION HERE

Clutch and Valve "Harmony" Is Machined from OHIO SEAMLESS TUBING

● Even in quiet flight formation every part of the operating mechanism must do its intended duty surely and continuously. At some of the most vital spots in many types of fighting aircraft, this wear-and-tear responsibility is shouldered by a partnership between OSTUCO Tubing and accurate machining and finishing.

Two such vital parts are valve rocker shaft bushings and high ratio clutch gear bearings. Beyond meeting strict Army and Navy specifications, special care is taken in drawing and treating the tubing to provide properties which help in later operations. For this reason Ohio Seamless Tubing has earned a remarkably consistent record of low rejection percentages over a long period of years.

OSTUCO is acquiring brand-new experience through its manufacture of seamless tubing from new steels, to new specifications, for never-before applications in machines designed for offensive action on land, sea and in the air. If this experience can help you with present problems or long-range planning, be sure to call on us.

MACHINED AIRCRAFT PARTS FINISHED FROM OHIO SEAMLESS TUBING. (PHOTO COURTESY OF CLEVELAND GRAPHITE BRONZE CO.)

THE OHIO SEAMLESS TUBE COMPANY

SHELBY OHIO OSTUCO

Your best LINE OF COMMUNICATION

THE NEW M·S·A

TELL·BOARD

BULLETIN DISPLAY CABINET

SAFETY BULLETINS

BE THOROUGH

HALF-WAY measures won't PREVENT ACCIDENTS

Modern in design, sturdily constructed of non-critical materials, this attractive new display cabinet is immediately available to increase the effectiveness of your wartime messages! Bulletins and other material can be changed quickly by a novel method—interior illumination invites attention day or night. Write today for details on TELL-BOARD's many unique features—ask for Bulletin CE-10!

MINE SAFETY APPLIANCES COMPANY

BRADDOCK, THOMAS AND MEADE STREETS

PITTSBURGH, PA.

District Representatives in Principal Cities

For your

SAFETY BULLETINS
MORALE POSTERS
DEPARTMENTAL NOTICES
INCENTIVE MESSAGES
PRODUCTION CHARTS
EXECUTIVE MEMORANDUMS
PLANT NEWS BULLETINS
SPECIAL INSTRUCTIONS, ETC.

details of installation exclusively. Poole Foundry & Machine Co.

–28–

FLUORESCENT LIGHTING—"Zeon," a catalog illustrated partially in color, presents a vivid picture of the beauties of correct lighting. A wide range of colors and possible artistic installations are suggested. Federal Electric Co., Inc.

–29–

FOOD—Two leaflets to help with "cooking" problems in industry. A pictorial description given of food carriers and a vacuum unit for keeping food hot and palatable during transporting or servicing. Vacuum Can Co.

–30–

FREQUENCY RECORDERS AND INDICATORS—Catalog N-57-161 illustrates types of recording instruments and indicators and their installation and maintenance. List of catalogs covering other electrical equipment included. Leeds and Northrup Co.

–31–

GRAPHITE LUBRICATION – Handbook explains the work which graphite performs and lists products supplied. There is an indexed guide to better lubrication for the lubrication engineer who wants to keep his machines at peak of performance. Nassau Laboratories.

–32–

GRINDERS—Dedicated to "the man in the shop, whose creed is craftsmanship and whose pride is accuracy," Catalog 42 describes, illustrates, and gives specifications for more than 15 tools. A cross-sectional drawing of each grinder explains the internal construction. Application pictures indicate range and scope of work that can be handled. The Dumore Co.

–33–

GRINDING—"The 'Know-How' of Grinding." Bulletin lists instruction aids for learning more about the art of grinding through motion pictures, a training course, or from informative literature. Order blank lists 14 handbooks of facts. Norton Co.

–34–

GRINDING WHEELS—Facts about grinding wheels and other abrasive shapes, and how to select them, are given in a 64-page catalog. Products are well illustrated and indexed. Bay State Abrasive Products Co.

–35–

HIGH FREQUENCY HEATING—Some of the applications of Thermex high-frequency

The Sunnen Precision Honing Machine will help you to

CONSERVE VITAL WAR MATERIALS

The coveted Army-Navy "E" waves over the Sunnen plant — evidence of the important part Sunnen equipment is playing in the war effort.

★ The greater accuracy of the Sunnen Precision Honing Machine assures fewer rejects — conserving not only vital war materials but precious man-hours of labor as well.

Since the Sunnen Precision Honing Machine is usually used to perform the *last* operation, its super-smooth finish and accuracy make possible absolute interchangeability of parts — another time and money saving feature.

Consider These War Production Advantages!

Skilled labor is not necessary! Operators, even girls in 'teens, can be trained in a few hours to handle jobs in "tenths."

The Sunnen Precision Honing Machine is *low in cost* — *economical to operate.*

Relieves big internal grinders for other important jobs.

Wide range — handles internal cylindrical surfaces from .185" to 2.400" in diameter. *No jigs or fixtures* — work is held in hands.

Accuracy within .0001" *guaranteed.*

Put Sunnen Honing to work in your plant!

Write for complete information — or we'll gladly have a Sunnen engineer call and show you what the Sunnen Precision Honing Machine can do on your job in your plant.

SUNNEN PRODUCTS CO., 7938 Manchester Ave., St. Louis, Mo.

Canadian Factory: Chatham, Ontario

SUNNEN

Diesel Engine Fuel Injector Cylinder "So accurate that a piston can be fit within .00005 inch."

Aircraft Valve Tappet Roller. 4-Micro finish.

Drill Jig Bushing "Increases sales appeal of product."

Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.

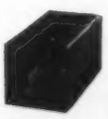
Inner Bearing Ring "Accurately removes last 'tenth' of stock."

Aluminum Aircraft Link "produces high finish without bell-mouthing."

Drawing and Blanking Die "Saves time in producing smooth base metal finish."

"Strict alignment maintained between two holes."

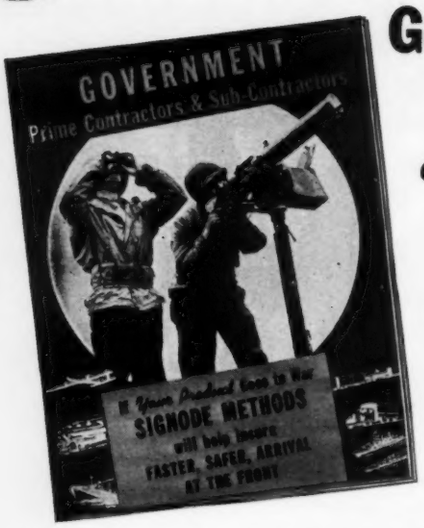
Aviation Hydraulic Cylinder made of Aluminum-Alloy Improves the quality of the bearing surface. An extremely smooth surface-finish is secured.



Saved time in producing a smooth, accurate finish on this bronze remote control valve body.

Cones for Wheel Balancing Machine "Accurately align hones two interrupted surfaces."

SIGNODE SYSTEM OF STEEL STRAPPING



Get This New Bulletin! on Wartime Shipping

★

Write for it Today

★

Shows Methods and Tools Widely Used for Safe, Fast Shipment of Vital Ordnance Materials, Ammunition, etc.

This new bulletin shows how government prime contractors and sub-contractors are using scientific Signode loading methods to assure "on time" delivery of shells, truck bodies, airplanes, inert bombs, life rafts and other vital war products. Also illustrates the Signode Tools used for safe application of Signode Steel Strapping. *Send for it today.*

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ROLOCK
PROCESSING CARRIERS
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BASKETS
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TRAYS

Speed up the handling of metal parts with a Rolock Processing Carrier that is designed and built specifically for your job.

Efficient parts-handling means faster production, and Rolock is equipped to build baskets, crates, trays, fixtures, etc. that are engineered to your requirements. Write today to the Rolock Engineering Department for recommendations.

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YOUR NEED
Filtrine FILTERS
IN YOUR FACTORY

BECAUSE they're thorough, removing *completely* all rust, sand, clay, vegetable and other suspended matter from the water, rendering it crystal clear for drinking and industrial purposes. Capacities range from 2 to 100 gallons per minute. Changing the filter medium is a matter of minutes; the filter itself lasts a lifetime for there is nothing to get out of order.

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THEY'RE EASILY INSTALLED, MODERATELY PRICED, AND *YOU NEED THEM BOTH.* There is a FILTRINE FILTER and a FILTRINE COOLER to meet *your* needs.

Write today for further information.

Filtrine
MANUFACTURING COMPANY
53 Lexington Ave., Brooklyn, N.Y.

electrostatic heating are described in 22-page bulletin. Principles, how it operates, power flow diagram, advantages, how Thermex can help in war production are among the headings of the sections. Illustrated with photographs and drawings. The Girdler Corp.

–36–

HUMIDIFIERS—Bulletin describes the application of humidification in various industries and benefits provided. Data on the use of humidifiers for the control of dust, lint, static electricity, and for adding to human comfort are included. Armstrong Machine Works.

–37–

ILLUMINATION—Facts to help plan better wartime fluorescent lighting. Bulletin explains power unit "999" which features cold cathode fluorescent illumination. National Transformer Co.

–38–

INDUSTRIAL ELEVATORS – Portable and stationary; electric, hand, or combination drive; revolvable or non-revolvable base —whatever the need in elevators—is covered in brief leaflet. Features claimed are outlined. Revolvator Co.

–39–

INDUSTRIAL TRUCK—Included in catalog dealing with approved models of industrial trucks, tractors, and trailers, is an explanation of the procedure for ordering a truck under the WPB Limitation Order L-112. Also detailed description and specifications on the various models, and an explanation of the application for each type. Mercury Mfg. Co.

–40–

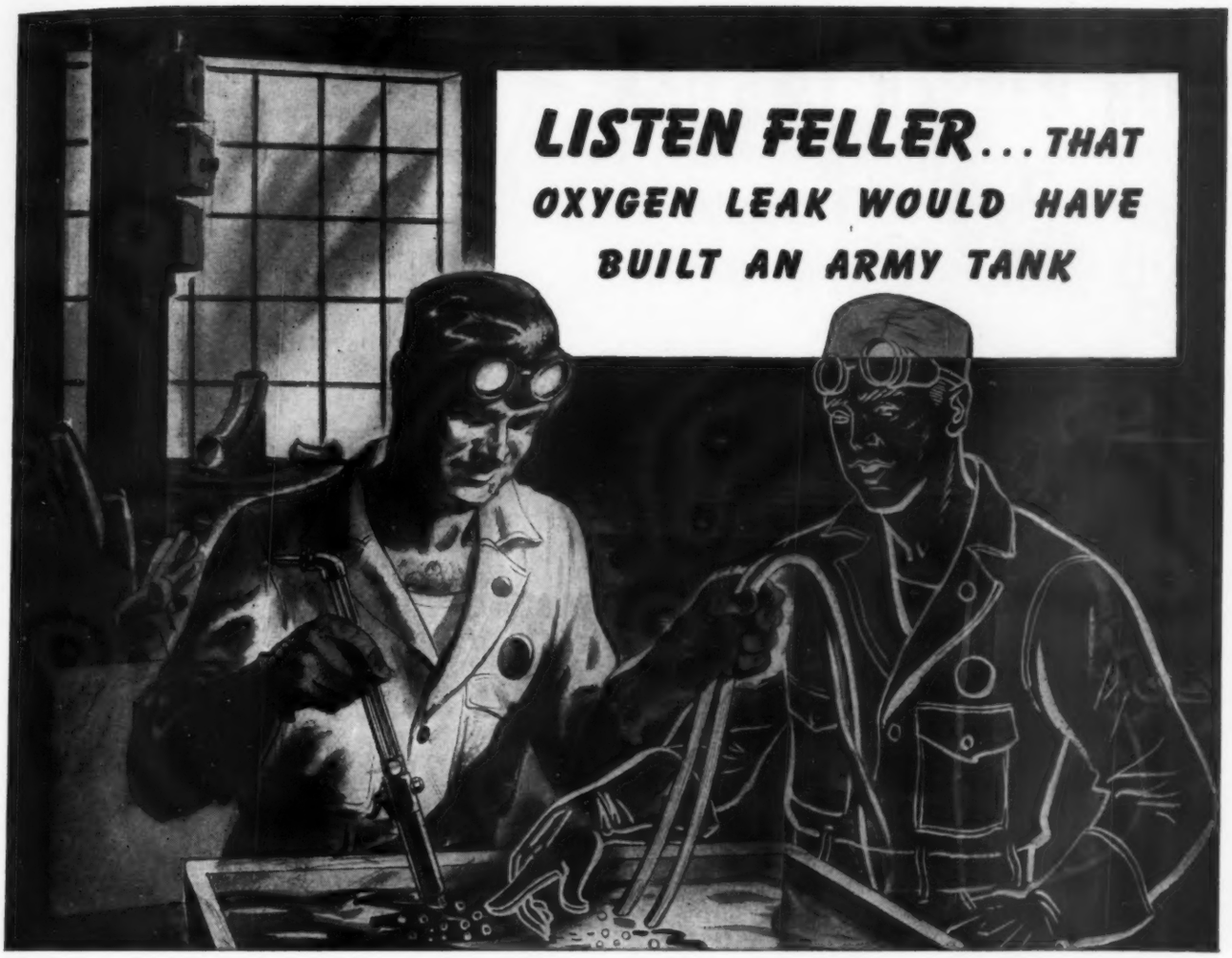
LATHE LUBRICATION – Importance of adequate lubrication to maintain maximum performance and accuracy is emphasized. Bulletin H-2 outlines a regular procedure of oiling with proper lubricants at definite intervals. Working illustrations. South Bend Lathe Works.

–41–

LIGHTING—Fluorescent or incandescent. The Champion Maintenance Manual tells in simple, non-technical language what is good lighting practice and what steps should be taken to get the utmost good for the longest period out of lamps and fixtures now on the job. Champion Lamp Works.

–42–

MARINE ROTARY PUMPS—Red, white, and blue folder contains information on



REPAIR ALL LEAKS IN HOSE AND CONNECTIONS

One leak as small as 1/64" in hose operating at 100 pounds pressure wastes 290 cubic feet of oxygen in 24 hours. It wouldn't take many days to waste enough to build an army tank.

That's why it is so important to conserve oxygen. Be on guard against these wasteful leaks — fix them promptly when they occur. In addition, do the following at regular intervals:

1. Inspect hose for leaks by immersing it in water — leaks occur most often near connections to regulator and torch.
2. Cut away bad portions of hose and splice good lengths together.
3. Use soap suds to check torches and regulators for leaks at connections.
4. And always send defective apparatus to repair shop for inspection and repair.

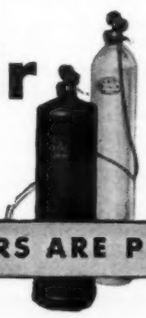
Be your own Waste Warden! Each additional cubic foot of oxygen saved means additional oxygen for war production.

THE WASTE WARDEN *says:*

DO close cylinder valve after use.
DO check your hose and connections for leaks.
DO keep your cylinder inventory low and return empties promptly.
DO keep tips clean and free from carbon and slag.

★ ★ ★

DON'T use excessive pressure.
DON'T use oversize tip.
DON'T leave torch burning when not in use.
DON'T abuse cylinders.



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MAGNOLIA-AIRCO GAS PRODUCTS CO.

AIRCO WILSON

IDLE CYLINDERS ARE PRODUCTION SLACKERS: *Keep 'em rolling for victory!*

THEN YOU ARE FACING SANITATION PROBLEMS

this guide will help you solve!

With more and more women now becoming directly engaged in the Nation's war production drive, plant personnel is on the increase. What does it mean to you? FIRST . . . the need of keeping lavatories, washrooms, rest rooms, shower stalls and locker rooms in scrupulously clean, ODOR-FREE condition to help protect employee health and prevent infection is far greater now than ever before. SECOND . . . that this work must be handled MORE QUICKLY and EFFICIENTLY to offset manpower limitations.

This NEW, 16-page sanitation guide tells you how you can meet these requirements easily, economically. It describes how a NEW, outstanding development . . .

OAKITE DEODORANT No. 1

. . . enables you to do THREE JOBS in ONE single, time-saving operation, with ONE material . . . DEODORIZE, CLEAN, DISINFECT! In other words, step-up sanitation efficiency and conserve man-hours by using a performance-proved, TRIPLE-DUTY material that completely destroys odors and leaves none, quickly and thoroughly removes ALL dirt and grime, and DISINFECTS surfaces to which it is applied.

WRITE TODAY FOR *FREE* MANUAL GIVING COMPLETE STORY!

This know-how handbook gives you the whole story . . . shows how easily the required solution of Oakite Deodorant No. 1 is prepared, how it is most conveniently applied, how it works, what it does, etc. Send for your FREE copy of this helpful, informative manual TODAY!

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OAKITE MATERIALS · METHODS · SERVICE — *Buy Bonds for Victory* — **CLEANING** FOR EVERY CLEANING REQUIREMENT

power and hand pumps for marine use. Mechanical design features are diagramed and illustrated. Blackmer Pump Co.

–43–

MECHANICAL RUBBER EQUIPMENT–A timely handbook covering details of the installation, maintenance, and repair of conveyor belting, elevator belting, transmission belting, V-belting, and hose. Composed for the busy man, it is in brief and graphic outline form. Indexed. 31 pages. Republic Rubber Division.

–44–

MILLING MACHINE–Universal type miller for either horizontal or vertical work, the Lombard 30HV, is described and illustrated in folder. Important features are briefly outlined. Lombard Governor Corp.

–45–

MOTORS–And how to care for them. Booklet contains tables showing characteristics and applications of types of motors. Text tells how to install, inspect, lubricate, clean, and overhaul motors for longer life. General Electric Co.

–46–

MUSIC IN INDUSTRY–How to introduce a "lift" in spirit and relieve the tedium of routine work, how to expedite war production, how to speed air raid instructions and warnings, how to keep an organization happy are outlined in a leaflet. Includes a typical music schedule for the working day. RCA Mfg. Co., Inc.

–47–

OIL BURNER–A 16-page catalog on the Hauck proportioning burner gives complete information regarding burner, together with diagrams for automatic control hookups, installation pictures, capacity table, dimensions, and other facts. Hauck Mfg. Co.

–48–

PAINT – Economical paint maintenance, greater dirt resistance, and high light values longer, are features claimed for wax-fortified paints described in 10-page booklet. Uses, types available, and specifications, as well as illustrations showing applications, are included. Color charts and price lists are in pocket on inside of back cover. S. C. Johnson & Son, Inc.

–49–

PAPER–The possible use of paper as a factor in the solution of some of today's problems of materials and production is outlined in well-illustrated booklet. That paper is readily subject to plasticizing, laminating, molding, impregnating, coating is emphasized. Illus-

SLOW Men NOT Working

IT NEED NOT HAPPEN HERE

modine

UNIT HEATERS are helping to insure man-power against colds and accidents

AMERICA IS LOSING 400,000,000 work-days of war production yearly —because of workers' injuries or sickness!

Every war plant must open a second front *now*—to protect workers—to stop this waste of man-power.

Employee training, preventive medicine...and improved working conditions will do it.

Planned heating will help you prevent worker colds and accidents. A plant heated by Modine Unit Heaters is a healthier place to work.

Thermostatically controlled . . . Modines *automatically* maintain *even temperatures* in all working spaces. No chilling drafts stiffen workers' muscles, or numb their hands and feet. No hot blasts make them uncomfortable, over-heated, or drowsy.

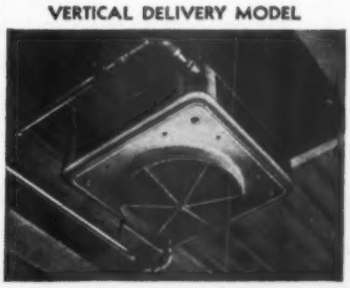
Modines' healthful, even heating insures worker comfort, raises resistance, builds up stamina *and* productivity. And Modines *conserve fuel* as well as productive man-power! *Get War Edition Catalogs 142B and 142C.*

Look in your phone book for Modine representative's name—"Where to Buy It" section under heating apparatus.

HORIZONTAL DELIVERY MODEL

modine
STEEL UNIT HEATERS
now available to
INDUSTRIES DOING WAR WORK

VERTICAL DELIVERY MODEL



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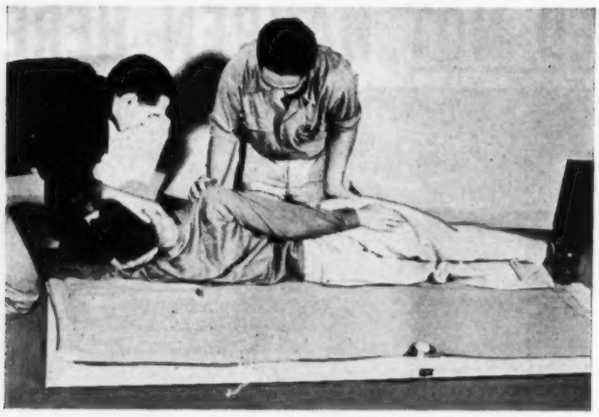
1730 RACINE STREET • RACINE, WISCONSIN

FOR LESS TIME-OUT WHEN ACCIDENTS HAPPEN



Teach **FIRST AID** *with* **SLIDEFILMS**

The S.V.E. series of slidefilms on First Aid provide an inexpensive method of teaching employees quickly what steps a layman can take to help an injured person. The seven slidefilms cover **bandaging, wounds, control of bleeding, fractures, artificial respiration, and transportation of the injured.** These films can be shown by any standard 35 mm. slidefilm projector. Easily operated **S.V.E. Projectors** are available on priority for Civilian Defense organizations, war plants and other users who need them for defense training programs.

Write Dept. I-F for listing and prices now!

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Guard Against Fire with WITT OILY WASTE CANS

A fire in your plant is sabotage, today. You can't afford it—any time.

Play safe, use your WITT Oily Waste Cans at convenient places throughout your plant for the disposal of oil soaked rags and other inflammable refuse.

Promote safety and cleanliness.

The **WITT CORNICE** *Co.*
Winchell Ave. Cincinnati, Ohio

Made in seven sizes: 5—6-3/5—8¼—12—14¾—22—30½ gallons capacity.

trated description of company's laboratory and production facilities is included. Byron Weston Co.

–50–

PAPERBOARD—Goes to War. Thirty-two-page booklet portrays use of various types of paperboard containers for tank parts, airplane parts, ammunition, food, and other supplies. Highlighted by official action photographs from U. S. Signal Corps. Container Corporation of America.

–51–

PIPE—All about pipe and pipefittings. Illustrated, indexed Catalog 37 gives data on types of pipe and tests undergone, specifications, list prices, carloading schedules, and pipe accessories. Naylor Pipe Co.

–52–

PLASTICS—A wartime guide to help engineers, designers, and industrial executives get an over-all picture of what plastics are and what they can do to help the war effort. Booklet describes the basic types of plastics, their possibilities, and limitations. Monsanto Chemical Co.

–53–

PLASTIC TUBINGS AND FITTINGS—Substitutes for strategic materials, Saran plastics are claimed suitable for tube transport of oil, gas, air, water, and corrosive chemicals. Elbows, tees, nuts, and unions are featured in molded fittings. Folder gives details of mechanical and general properties, uses, and sizes. Hodgman Co.

–54–

PLEDGE CARD—"American Workman's Wartime Pledge" is printed in black and blue on a white 4x6 card. Holder pledges to "take care of tools and machines . . help and instruct fellow workmen . . waste neither time nor materials, to the end that all of America's production resources may be dedicated to final and complete victory." Card requires no signature. Available on request from The Koebel Diamond Tool Co.

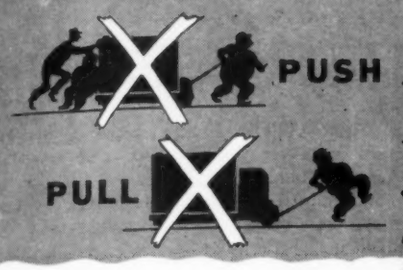
–55–

PUMPS—Catalog D2-1042 covers data on the SCV pump which is adaptable for hot or cold water circulation, brine circulation, air conditioning and sprinkler systems, as units for boiler feeding, pressure boosting, washing machinery, and for food processing and brewing industries. Economy Pumps, Inc.

–56–

PUMPS—For use in food and beverage processing plants, line of sanitary pumps—includ-

Motorize Your Hand Truck Operation with the CRESCENT



LO-LIF-TOER

$1750 *Including*

BATTERY - CHARGER - TRUCK

f.o.b. Lebanon, Pa.

Crescent Lo-Lif-Toer Foot Lift Truck. Type LIDF. Capacity 2500 pounds.

The Crescent Lo-Lif-Toer Does All Three!

Only *motorized* hand truck operation can keep pace with the speed of all-out war production. And the Crescent Lo-Lif-Toer cancels all former figures on the cost of equipment for motorized materials handling! The Lo-Lif-Toer is complete with battery and charger at the tradition shattering price of $1750. Operator never dismounts to load, lift or unload—that's why 1 man can do the work of 3. Investigate—write for free Lo-Lif-Toer facts.

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LOAD LIFTING.

LOAD TOWING.

INDUSTRIAL SALES REPRESENTATIVES — A few exclusive territories available. Profitable proposition to qualified men. Write for complete information and tell us about your experience.

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NEW folder . . . just published . . . gives full information about the history making Crescent Lo-Lif-Toer Trucks. Write for your free copy today.

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CRESCENTIZE CRESCENT TRUCKS TRACTORS *YOUR HANDLING*

KERLOW

Why War Plants Need KERLOW open STEEL FLOORING

Today, the advantages of Kerlow Open Steel Flooring are more important to industrial plants than ever before. Here are five reasons why: 1. Safety . . . open-mesh, non-skid design reduces accidents. 2. Light . . . as 85% of floor area is open, there is ample passage for light. 3. Ventilation . . . air, fumes, heat and odors pass through floor openings readily. 4. Permanence . . . will outlast any other type of floor. 5. Economy . . . first cost is low, installation is simple and only maintenance expense is occasional repainting.

FREE BULLETIN Write for your copy today

KERLOW STEEL FLOORING CO., 27 Mallory Ave., Jersey City, N. J.

Make Every Pay Day a Bond Day — Buy U. S. War Bonds and Stamps

KERLOW RETICULATED DESIGN ...A PATTERN FOR VICTORY

How can you be sure of CHOOSING THE BEST WORKER *for the job?*

Increased demands for speed and quantity of production—scarcity and inexperience of labor—and other conditions complicate the job of hiring and placing people today. But Charles Drake has discovered, developed, and here presents a new approach to aptitude testing to help you meet these problems. No highly specialized knowledge required; utilizing data available in your plant, you can design tests of unusual simplicity and directness, that will pay big dividends in disclosing the most capable and trainable applicants and employees.

Learn how from this concise, readable book

Here is a new, realistic, and practical technique for the selection of industrial personnel. The method consists primarily of designing special performance tests embodying the essential elements of dexterity and perception discovered by analyzing an industrial job or group of similar jobs. The treatment is concise and clear, and many illustrations of actual tests provide a usable guide for industrial engineers, personnel workers, and others in employing this technique.

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PERSONNEL SELECTION by Standard Job Tests

By CHARLES A. DRAKE

Head, Methods Department, United Merchants and Manufacturers Management Corporation. 140 pages, 6 x 9, illustrated. $2.00.

SHOWS YOU:

- how to design simple tests based on the actual manual abilities and perceptions required in a job or group of jobs
- the basis of the method and how it compares with other types of testing
- principles, methods, and examples of test design and operation
- methods of scoring and interpreting results

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Send me Drake's Personnel Selection by Standard Job Tests for 10 days' examination on approval. In 10 days I will send $2.00, plus few cents postage, or return book postpaid. (Postage paid on cash orders.)

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City and State .....
Position .....
Company .....Fac. 1-43

ing electric motor, V-belt drive, flat-belt drive, and variable speed units—is shown in illustrated 4-page folder, Bulletin 115. Page 4 is devoted to specifications of the various types of pumps. Blackmer Pump Co.

–57–

RESPIRATOR—Folder describes the Dustrid mask for purifying air as it is breathed in. Weighs about ½ ounce, fits over nose and mouth. Permits conversation and wearing of glasses. Leaflet describing Mag-Optin, plastic remover of particles that get into workers' eyes, also is available. Allergy & Medical Products Co.

–58–

ROLLER GRAVITY CONVEYORS—Inside story about roller gravity conveyors and parts. Supports, switches, stops, and various accessories are shown. Gives a table on selecting conveyors for various package sizes, and illustrates several applications. Lamson Corp.

–59–

SAFETY EQUIPMENT — Catalog 50, "Everything for Safety," includes 134 pages of illustrated and described equipment for accident prevention and safety. List of emergency supplies is included. Boyer-Campbell Co.

–60–

SAFETY TREADS—Reliable surveys show that a large percentage of workers' accidents are caused by falls from slipping. Workers need safe footing. Morton Kass safety treads of steel are explained briefly in a 4-page bulletin. Morton Mfg. Co.

–61–

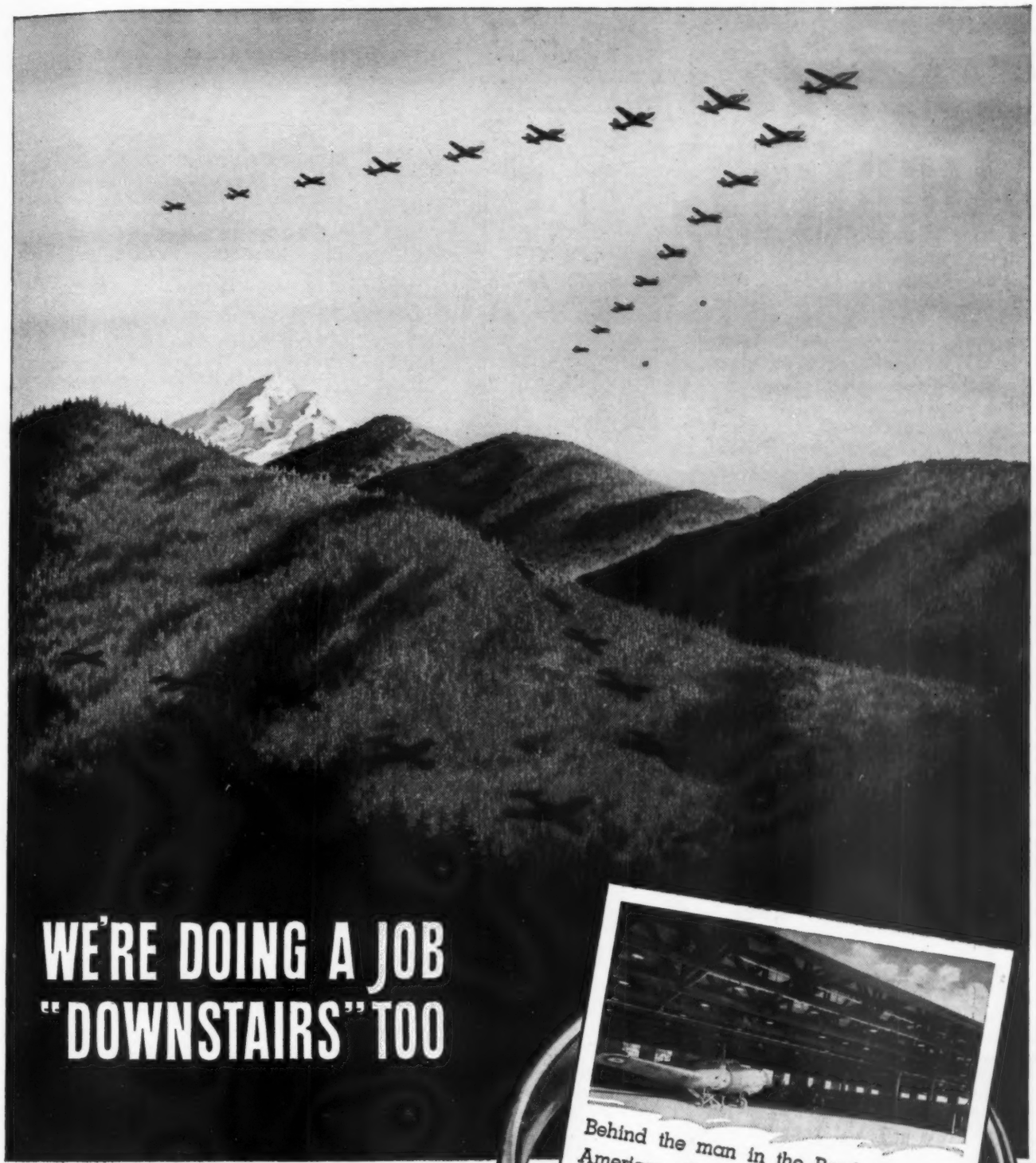
SAFETY SWITCHES — Bulletin 42-12 brings news of the 575-volt Rolarc safety switch available in 100 to 600-amp. capacity. Other types of safety switches and catalogs covering them are briefly listed. Federal Electric Products Co., Inc.

–62–

SEWERS AND DRAINS—Specific information on sewer and drain stoppages—the common causes and the most efficient remedies. Description of the Roto-Rooter, claimed to be 98 percent effective remedy for roots, grease, scale corrosion, and other debris in sewers and drains. Roto-Rooter Corp.

–63–

SHORT CENTER DRIVES—Catalog ED-42 deals with V-belt and flat-belt drives, includes data on motor base mountings for special applications. Photographs and case histories of typical power-transmission installations are featured. Blueprints, drive selec-



WE'RE DOING A JOB "DOWNSTAIRS" TOO

Behind the man in the Bomb Bay, the American Forest fights. This typical double hangar, timber engineered with TECO-connectored timber trusses, houses Uncle Sam's fighting war birds. You, also, can now have clear-span timber trusses—as wide as 200 feet. *Write Us Today.*

The TECO Ring Connector spreads the load on a timber joint over practically the entire cross-section of the wood . . . brings the full structural strength of lumber into play.

Timber ENGINEERING COMPANY

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Bin LIGHTING

For full illumination of Parts Bins, Tool Crib Bins and Shelves, Stockroom Shelves, Carton Stacks, File Rooms, Library Stacks — wherever you need "quick, accurate seeing" from top to bottom, install PERMAFLECTORS, the silvered-glass reflectors especially designed for this purpose. Easily, quickly, inexpensively installed. Get prompt delivery . . . No priority on GLASS!

HIGH-EFFICIENCY PERMAFLECTORS of

SILVERED GLASS

Conserve Critical War Materials
Assure Prompt Delivery!

Decrease Spoilage — Reduce Accidents — Speed Production

Light Up THE WEAK SPOTS IN YOUR PLANT!

Need MORE light, BETTER light here and there in your production line? ✪ Put in Permaflector "Auxiliaries" — the high-efficiency, silvered-glass reflectors that put the light where you need it, as you want it! ✪ A size and shape for any desired distribution. ✪ Easily, quickly, inexpensively installed without affecting work flow. ✪ Use Minimum Critical War Materials! ✪ Specify Permaflectors! ✪ A Pittsburgh lighting engineer will be glad to go over your plant without obligation!

PITTSBURGH REFLECTOR CO.

"Pittsburgh" Permaflector

407 OLIVER BLDG. - PITTSBURGH, PA.

Tear Off

Clip to letterhead. Sign. Mail for complete information, prices.

tion tables, and dimension tables are included. The inside front cover is devoted to hints on conserving drive belts. The American Pully Co.

–64–

SKIN PROTECTION–Research on industrial dermatitis and its control is briefly summarized and presented in the illustrated booklet "Fend." Describes Fend skin creams and lotions and their uses for protecting workers' skins. Mine Safety Appliances Co.

–65–

SOUND SLIDE FILM–Bulletin entitled "Supervisory Development Program for Greater War Production" describes and illustrates series of 12 films that comprise a training program for foremen and supervisors. Leader's guide, foremen's notebook, discussion manuals to accompany films are also mentioned. Vocafilm Corp.

–66–

STEEL STRAPPING–A timely catalog on equipment to expedite shipping and handle the load of defense traffic. Systems of reinforcing and protecting small shipments, of bulkbinding, and of carload shipments are pictorially presented. Other shipping problems also are treated. A leaflet of equipment for prime contractors and subcontractors supplements the catalog. Signode Steel Strapping Co.

–67–

SUBCONTRACTING–In addition to heat transfer products, Young Radiator Company is now featuring special light and heavy sheet metal war products. Spare parts, boxes, ammunition boxes, duct assemblies, surge tanks, and oil sumps are some of the products illustrated and described in a brief leaflet. Young Radiator Co.

–68–

SUBSTATIONS–Who uses substations and why. A graphic publication explaining substations. Sketches of typical system arrangements and of networks are included. Typical specifications of various units and tables of weights and dimensions are given. General Electric Co.

–69–

THERMOCOUPLES–Styled as a supplement to Thermocouple Data Book S2-3, 6-page bulletin interprets recently amended WPB Conservation Order L-134 as it applies to use of thermocouples and protecting tubes for pyrometric instruments. Recommends material that will serve in place of those prohibited. Wheelco Instruments Co.

–70–

THERMOSWITCH–Heat control for industry is explained in folder on types of ther-

QUESTION---How to remove from factory floors the hard-caked grease that causes accidents and slows plant traffic . . . without resorting to slow tedious hand-scraping which wrecks floors

Answer---

HILD SYSTEM DRY SCRUBBING

Two easily interchangeable attachments adapt the HILD Floor Machine for "dry-scrubbing" factory floors of all kinds.

Here's a modern, *mechanized* method of cleaning and smoothing rough, bumpy, dirty factory floors of all kinds. It saves man-power, removes the caked grease and dirt that slows down stock trucks and causes expensive accidents . . . and prevents damage to floors. HILD Floor Machines, with a variety of easily interchangeable attachments solve *every* industrial floor maintenance problem . . . provide clean, *slip-safe* floors without interrupting continuous 24-hour-per-day operation.

WRITE TODAY FOR FREE BOOK

Fully describes both HILD System Dry Scrubbing and HILD System Shower-feed Scrubbing with Vacuum Drying.

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FLOOR MACHINE COMPANY

Representatives in 48 States

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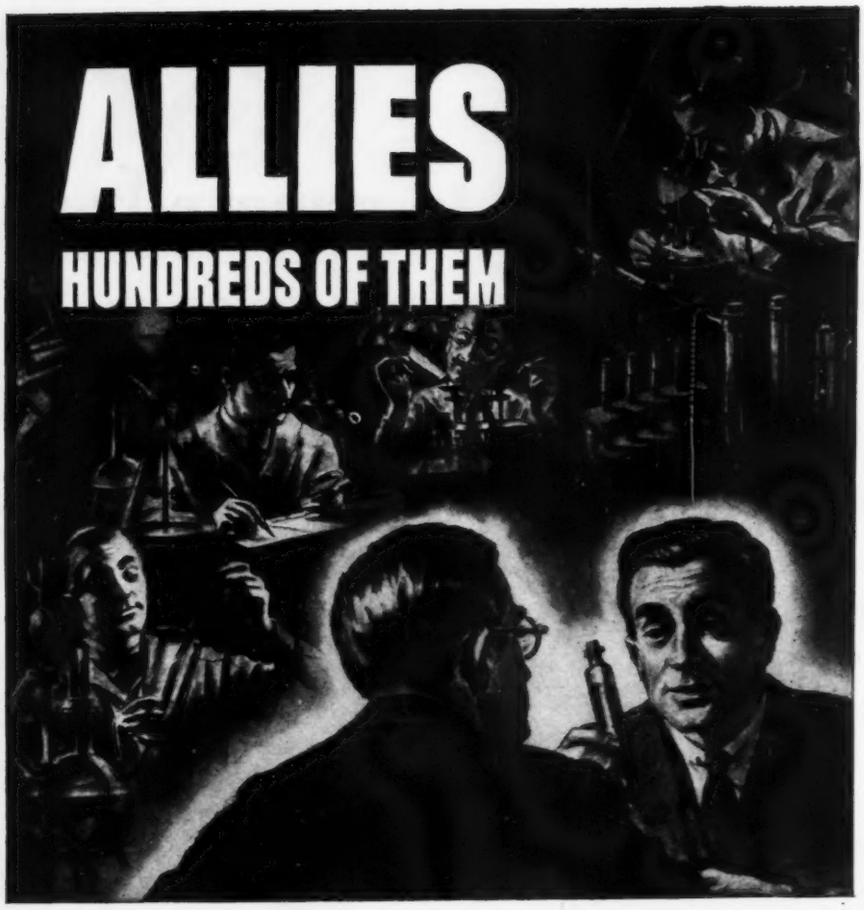

When you discuss industrial health with a WEST specialist

Because he brings with him the experience of hundreds of chemists, bacteriologists, industrial physicians, scientists, safety engineers and plant managers who have contributed to making West one of the greatest organizations of its kind in the world.

*LAN-O-KLEEN the Soap that Helps Keep Hands Healthy

Lan-O-Kleen has *proven* its value in helping prevent occupational skin diseases in many of the largest war plants from coast to coast. Lan-O-Kleen is not only an effective cleaner that works mildly and without harsh chemical action—but it actually leaves the hands feeling better, more fit for work. • Lan-O-Kleen is a powdered soap of *mildly* alkaline reaction compounded with granular corn-meal which has been impregnated (by an exclusive process) with LANOLIN, an oil almost identical to the natural oils secreted by the glands of the skin. Lanolin helps nature to maintain a normal, healthy skin condition. • Help prevent occupational skin diseases with their resulting lost time accidents and slower production. *Investigate* LAN-O-KLEEN.

*Trade Mark Reg. U. S. Pat. Off.

55 BRANCHES • "PROMOTING HEALTH IN INDUSTRY" • COAST TO COAST

CLIP TO YOUR BUSINESS LETTERHEAD PLEASE

West Disinfecting Company, Dept. J, 42-16 West Street, Long Island City, N. Y.

Please send me a SAMPLE QUANTITY of Lan-O-Kleen with which I will give your claim a practical test. Please include folder explaining its use.

Name_____ Title_____

WEST DISINFECTING Company

42-16 WEST STREET • LONG ISLAND CITY • N. Y.

moswitches and their application. Labeled diagram of switch shows construction. Illustrated. Fenwal, Inc.

–71–

TRUCKS—Leaflet, Form S-116, describes three-in-one truck that is a load carrier, a low lift truck, and a towing truck built as a unit. Other types of electric trucks also are shown. Crescent Truck Co.

–72–

VISIRECORD—A timely leaflet offering to solve report and record problems created by the Production Requirements Plan. Discusses and illustrates the workability of a flexible, fully indexed file system. The Visible Index Corp.

–73–

VITAMINS—As a necessity in the production of body energy are considered in a brief pamphlet "Vitamin B-Complex." Folders on BeCoTabs, BeCoPerles, and Vitamin A and how to add more vitamins to the daily diet also available. Endocrine Food Co.

–74–

VITAMINS—Mimeographed 2-page description of Vita-Gems, a food in capsule form. A working week's supply comes packaged in Sani-Tape strips for one-a-day use. Lists standard daily vitamin requirements. R. F. Peabody & Co.

–75–

WAR PRODUCTS—News Service, Vol. XXVI, Nos. 11–12, features two fact-filled articles on "Cooling and Lubricating the Tools of War" and "Bombs—Precision Instruments of Destruction." Oakite Products, Inc.

–76–

WARTIME MAINTENANCE DIGEST—A digest of 41 essential maintenance jobs generally performed in factories and mills prepared in data sheet form for convenient, quick reference. Materials used, method followed, time saved, fire or other hazards eliminated, and other advantages are discussed. Oakite Products, Inc.

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WELDING POSITIONER—A colorful, well-illustrated, 4-page bulletin, No. 205, gives a complete description of the Ransome 20-ton capacity welding positioner. Ransome Machinery Co.

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WOOD PRODUCTS—Designed to save critical steel. Two leaflets illustrate and explain briefly the Victory wood locker and the IveLock wood shelving system which needs no hardware and is adjustable. Ivel Corporation.